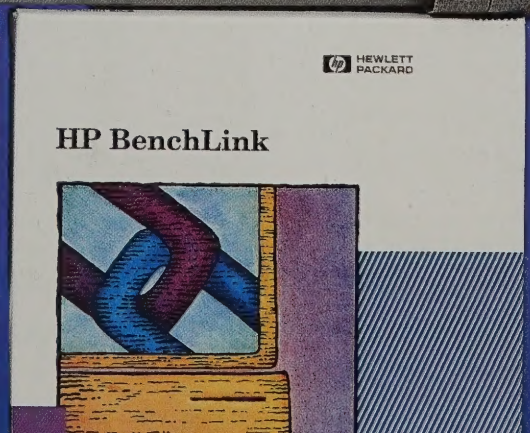
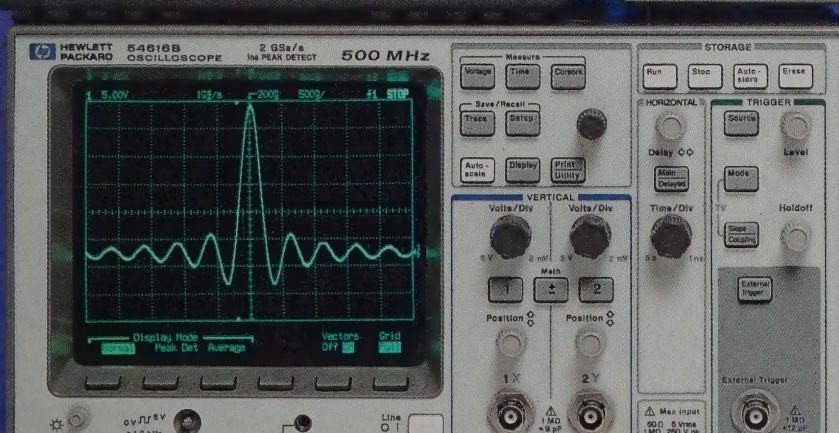
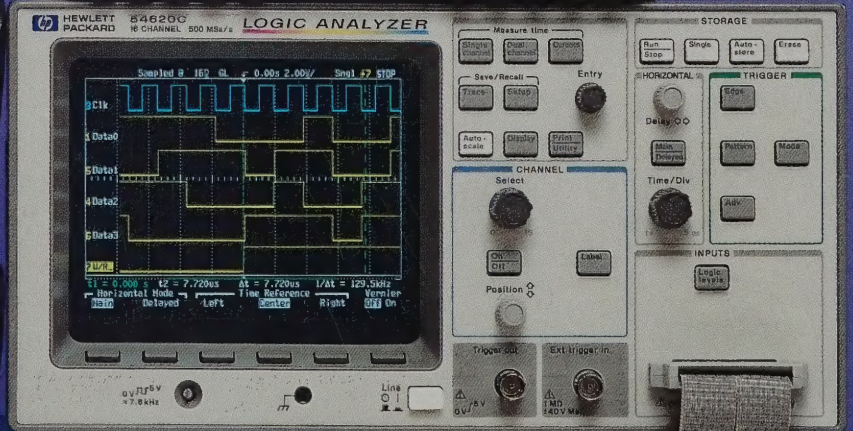
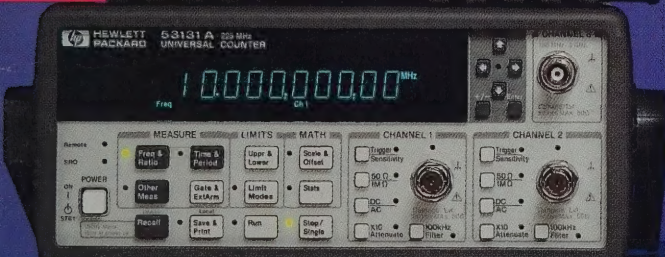
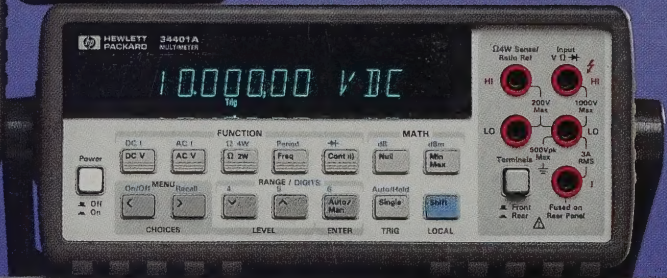
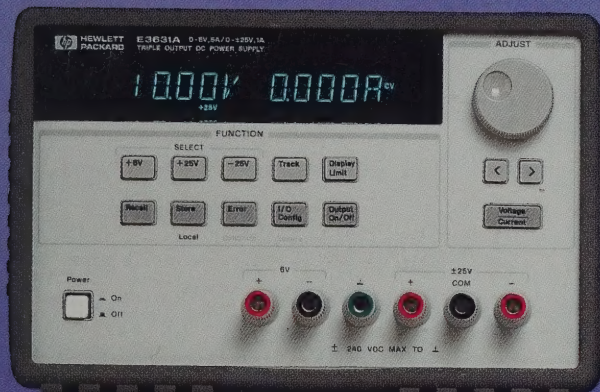


HP

Basic Instruments Catalog 1996

Your budget's limited.
Your equipment doesn't
have to be.

H P D I R E C T

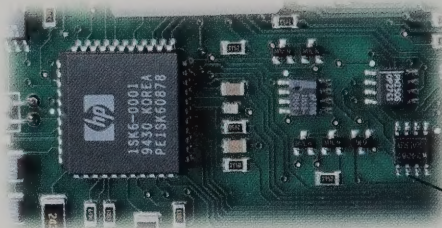


Here's what happened when we put

Some interesting things happened when we made engineers responsible for lowering the costs of our basic instruments. They didn't skip QA testing, compromise performance, or resort to cheap materials.

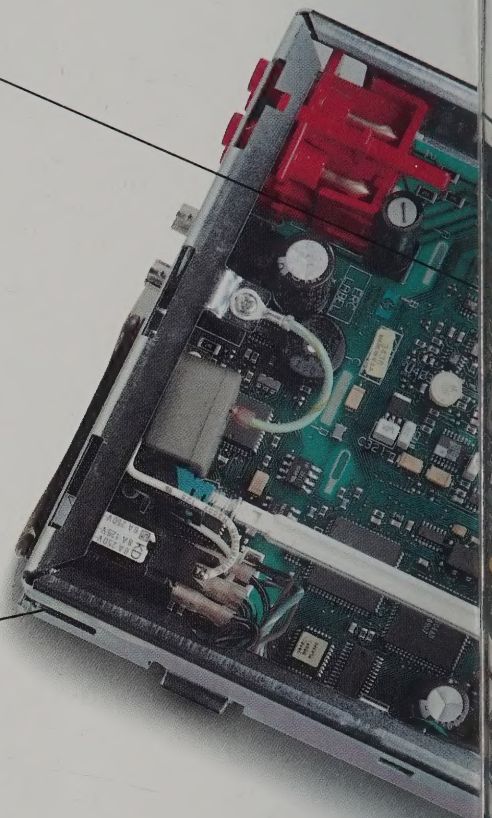
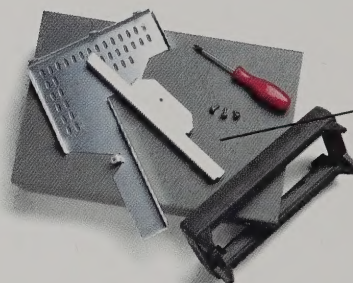
They designed new integrated circuits to replace piles of discrete components. They made instruments easier (and faster) to assemble. They took technology developed for our high-end products and adapted it to basic instruments.

The result? Instruments that fit today's tight budgets without compromising your need for performance and reliability.



Benefit from advanced technology without paying for it.

Our engineers routinely borrow components, algorithms and design ideas developed for HP's top-of-the-line instruments to give you great performance at lower prices. The analog-to-digital converter in the HP 34401A DMM, for instance, is a scaled version of the ADC in our high-performance HP 3458A.



Within budget, without compromise.

All instruments in this catalog are manufactured at sites that have been ISO-9002 certified and are CFC-free.

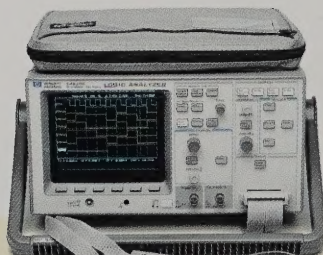
You'll spend less because we spend less.

With a new design that cuts assembly time, incorporates custom ICs to reduce the parts count, and simplifies QA testing, we spend less building the HP 34401A (from 20 minutes down to 6!). These design changes improve performance and reliability, too.

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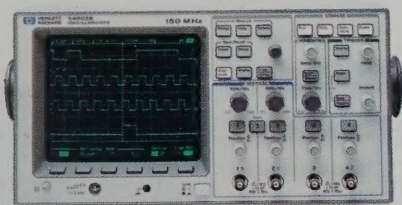


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engineers in charge of cost control.



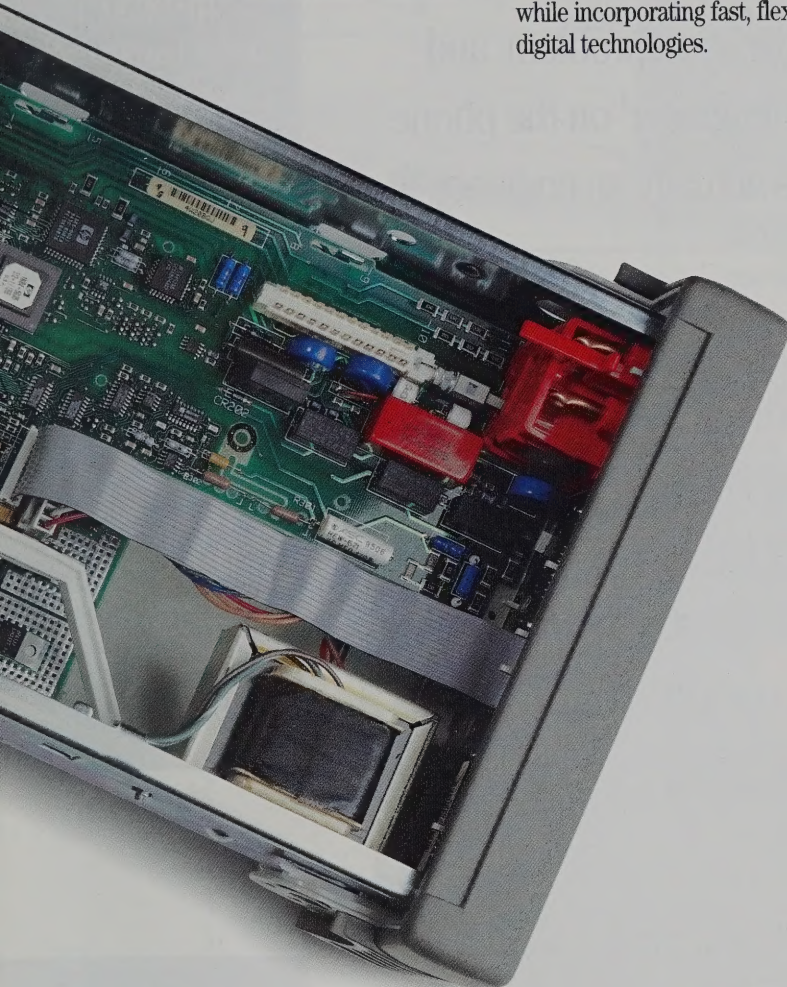
You did a nice job of designing these.
Thanks.

You're not bashful about telling us what you like and don't like. That's why the HP 54600-series scopes, for instance, preserved the look and feel of your comfortable old analog scope while incorporating fast, flexible digital technologies.

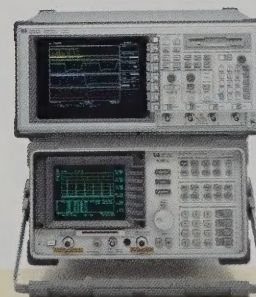
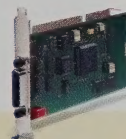
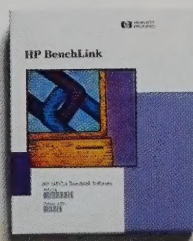
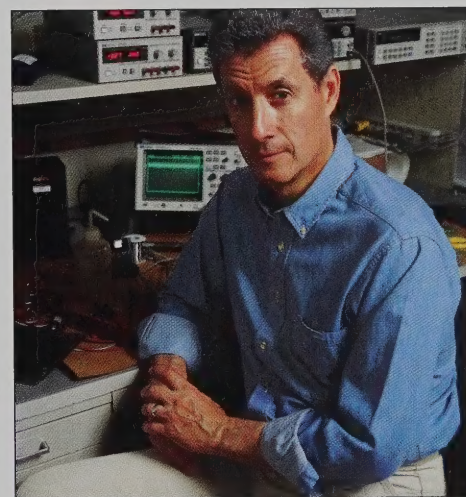


If you can change, so can your instruments.

One of your biggest gripes is getting stuck with equipment that no longer meets your needs. Basic instruments grow along with you, whether it's a scope module to add new measurements or HP BenchLink software to create new test capabilities.



“When HP said they had low-cost instruments, my first reaction was ‘Yeah, right. What did you leave out?’ But the HP 34401A DMM was everything HP promised it would be.”




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
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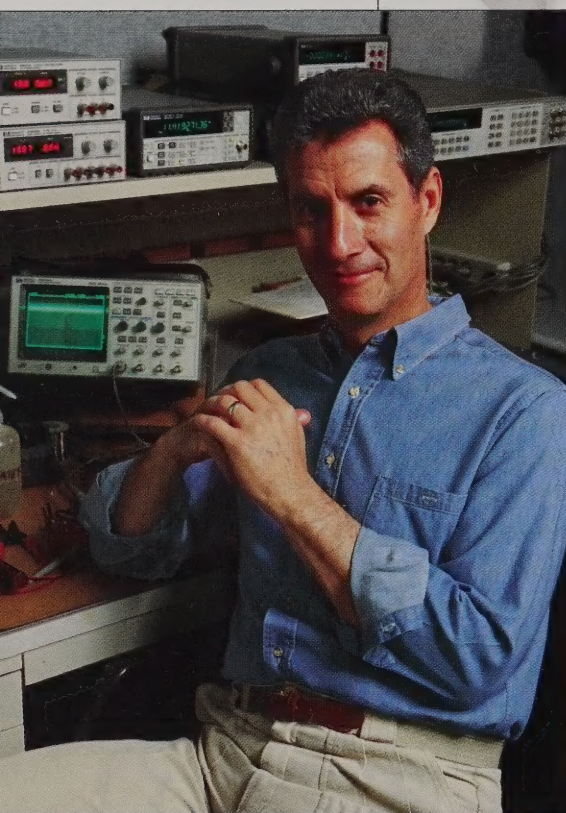
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And here's what happened when



“Now there's a switch. I called in to discuss an application problem, and the 'engineer' on the phone was actually an engineer.”

The experienced engineers on-line at HP DIRECT know how to make the measurements you need to make.

“When I need to compare products, the engineers at HP DIRECT know how their equipment stacks up against the competition.”

Get the data you need by phone, fax, mail or on the Net.

“I have zero time to spend on the phone. When all I need is a data sheet or something simple like a connector, HP DIRECT takes care of me without wasting my time.”

You won't find any 30-minute answers to 30-second questions here.

we put engineers on the phones.

We're ready for your toughest questions.

When you call HP DIRECT, you can talk with engineers like Scott DeBenning. Scott got his BSEE from Cal State Hayward, and he's been with HP ever since — 14 years now. He knows these tools inside and out, and he knows the people who design and build them. In other words, if you have questions,

Scott has answers.



What do you need? A cable?
Performance specs? Consultation with an engineer?
HP DIRECT is the one information resource for all
your basic instrument needs.

1-800-452-4844

P A G E

3

HP 54600-series scopes

The feel of analog and the power of digital.

Start with what you love about analog.

When you're troubleshooting, you want to stay focused on two things: the circuit and the display. That's why the straightforward front panels and real-time display response of analog scopes made them such vital pieces of equipment.

You'll feel right at home with the HP 54600-series digital scopes because they preserve the usability of an analog scope while delivering the power of digital. Front-panel knobs look and work just like the knobs on your old analog scope. You don't have to change the way you work, which means you won't lose time getting used to a new style of test equipment.

With three processors working in unison, the HP 54600-series scopes update the display at rates as high as 1.5 million points/second (depending on the model). When you make a change on the front panel, or your input signal changes, you'll see the results instantly.

The new real-time vector display mode on the HP 54600-series makes your signal even easier to see. Slowly changing portions of waveforms appear brighter on the display, while rapidly changing portions appear dimmer. No other digital

scopes produce waveforms that provide this much visual information or look this close to analog.

Add the punch of digital.

In addition to bright, flicker-free traces at all sweep speeds and input frequencies, digital measurement opens up entirely new possibilities. Pretriggering, for instance, lets you look back in time to see what was going on before the trigger event occurred.

Precise, dependable results are another major benefit. With timebase settings as low as 1 ns/div, you'll get more

insight into waveform details. Horizontal accuracy as good as $\pm 0.005\%$ delivers more dependable results than analog scopes, too.

Seeing and storing your toughest signals.

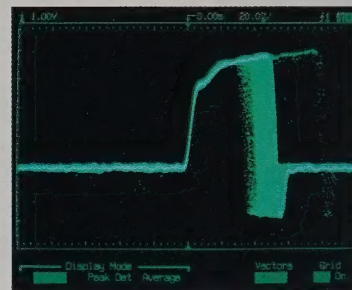
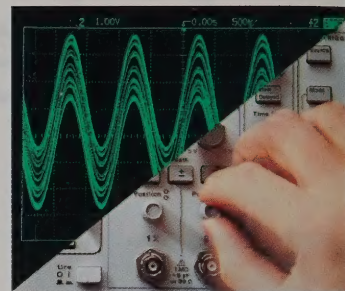
The definition of good test equipment is that it helps you get your job done easier and faster.

- Autoscale frees you from resetting the scope every time you move the probe. Simply press Autoscale, and the scope sets voltage, time and trigger parameters to deliver a useful display instantly.

You'll love using these scopes.

1-800-
452-4844

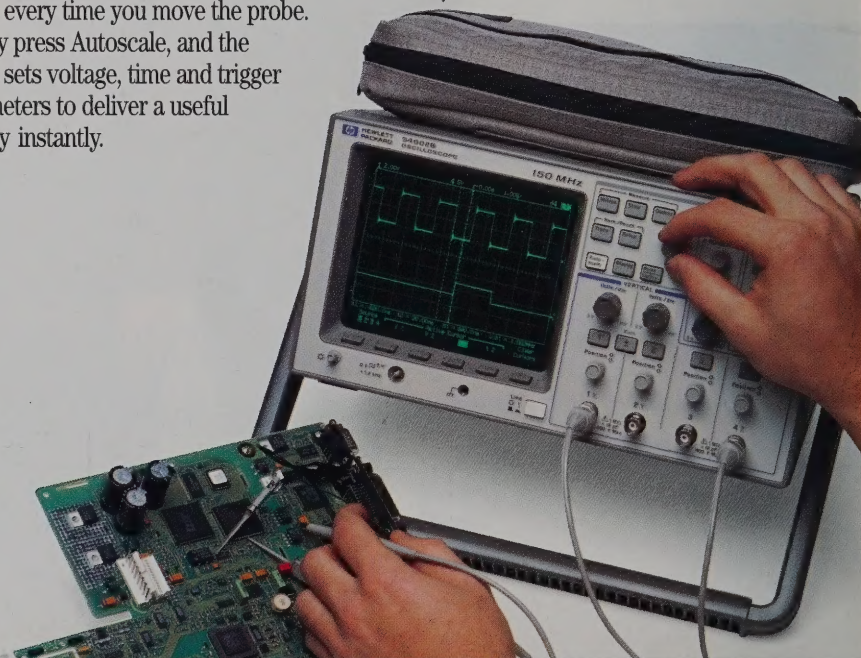
Turn a control knob and your scope reacts instantly.



Autostore shows you signals you can't even see on an analog scope.

- With Autostore, the current waveform displays at full brightness while previous waveforms stay on the screen at half brightness, so it's easy to see history and the current trace at the same time.
- All HP 54600-series scopes feature 10 GSa/s effective sample rate for repetitive signals.
- The HP 54615B/16B models also offer single-shot sampling rates of one and two GSa/s, plus peak detect that can catch transients as narrow as 1 ns at any sweep speed.

HP 54600-series
starts at
\$1,995



The future
is already here.

Don't worry.
So are the new test
tools you'll need.

When you're creating next-generation products, the last thing you need to worry about is how you're going to test those innovative new designs.

Stick with HP and you won't have to worry. We'll be there to meet your test needs, no matter where markets and technologies take you.

Want proof? The new HP 54645D mixed signal oscilloscope seamlessly integrates analog and digital measurements, and the HP 54645A two-channel scope combines the fast response of a troubleshooting scope

with the storage of a deep-memory scope.

Turn the page to see how these unique tools can help you.



HP 54600-series scopes

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You'll love using these scopes.

1-800-452-4844

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Precise, dependable results are another major benefit. With timebase settings as low as 1 ns/div, you'll get more

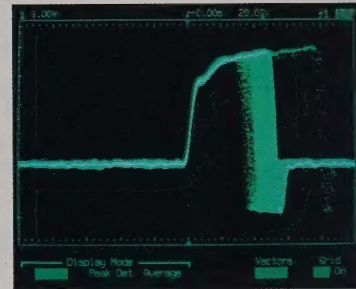
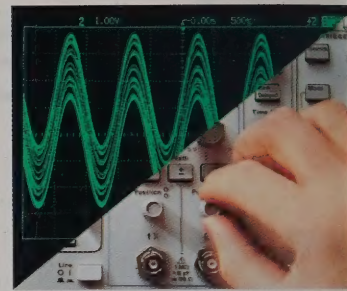
insight into waveform details. Horizontal accuracy as good as $\pm 0.005\%$ delivers more dependable results than analog scopes, too.

Seeing and storing your toughest signals.

The definition of good test equipment is that it helps you get your job done easier and faster.

- Autoscale frees you from resetting the scope every time you move the probe. Simply press Autoscale, and the scope sets voltage, time and trigger parameters to deliver a useful display instantly.

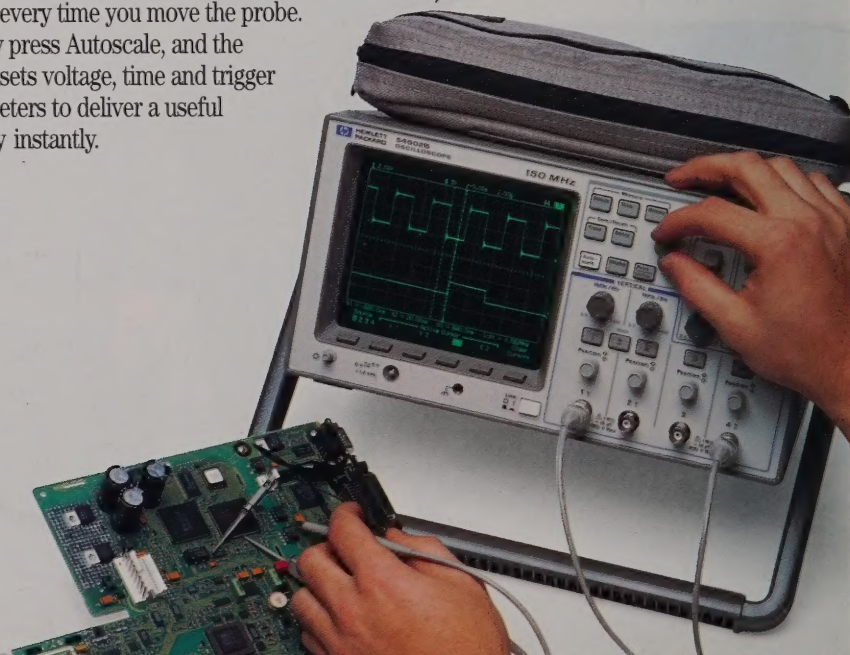
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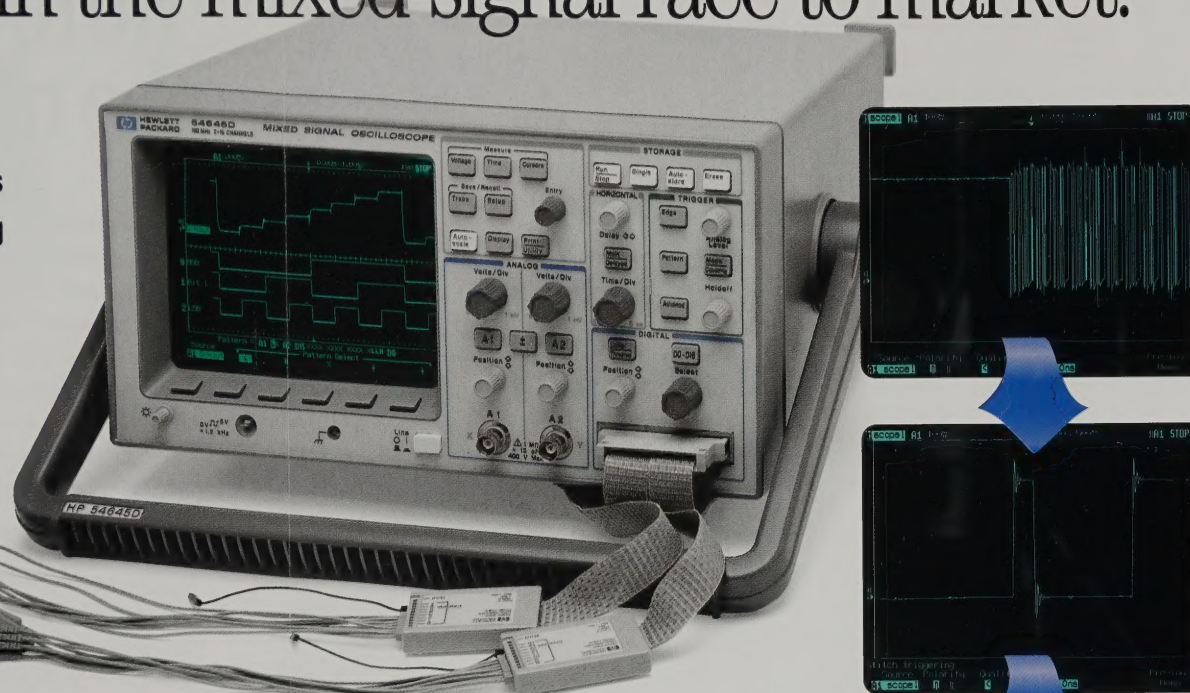
HP 54600-series starts at \$1,995



Discover a shortcut in the mixed-signal race to market.

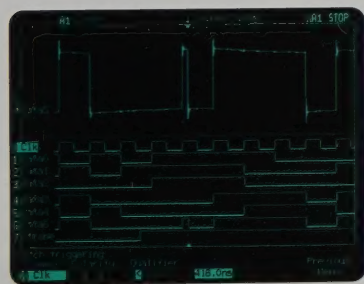
The days of straightforward analog circuits and tame 4-bit microcontrollers are coming to an end. Now you're wrestling with 8-bit and even 16-bit microcontrollers, and your designs often mix a variety of analog and digital signals. When you try to test these complex designs with your trusty old scope, the finish line looks farther away than ever.

\$4,995



A new solution to a new set of problems.

It's quite a dilemma. Your latest mixed-signal and microcontroller-based designs



This simultaneous (and totally synchronized) analog and digital measurement shows the timing relationships among eight data lines and a detailed analog look at a glitch on one of those lines.

are getting too complex to test with a scope, but you can't justify the learning time and expense of a traditional logic analyzer. And

even if you could, you still need a reliable way to synchronize and compare analog and digital measurements.

The new 18-channel HP 54645D mixed signal oscilloscope combines the detailed signal analysis of a scope with the multi-channel timing measurements of a logic analyzer. With 16 powerful digital channels, a pair of 100 MHz (200 MSa/s) scope channels and powerful triggering, you can capture and analyze the signals and relationships that matter most. No more guesswork and no more poking around a few channels at a time.

Do things a scope can only dream of.

The HP 54645D not only makes mixed-signal testing faster and easier, it also does things a scope simply can't do. Like correlating a serial data sequence with variations in an

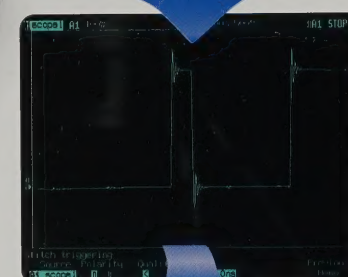
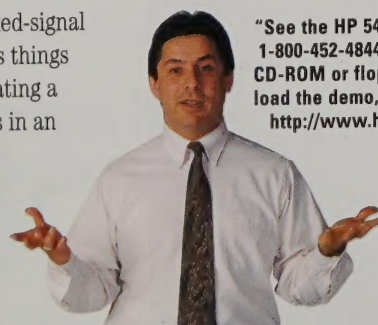
analog signal or triggering on a mix of digital bus states and analog signal details.

You'll also be pleased to know you don't have to get a black belt in logic analysis to use the HP 54645D. The digital channels work just like the analog scope channels, so you'll be making successful measurements within minutes.

Not only more signals, but more of each signal.

The HP 54645D also offers HP's exclusive new MegaZoom™ signal capture technology. Stream full bandwidth data into memory, then go back and search for details with the same intuitive controls you use for all other scope operations.

"See the HP 54645D in action. Call 1-800-452-4844, Ext. 1464 for your free CD-ROM or floppy disk demo. To download the demo, visit our web site at <http://www.hp.com/info/mixedsig2>"



MEGAZOOM:™

See more than ever before.

With most digital scopes, memory limitations force you to choose between bandwidth and the amount of signal data you can capture. (Or you could choose a hard-to-use deep memory scope.) With HP's new MegaZoom™, you don't have to compromise. You can capture millions of full-bandwidth samples, then easily scroll through the data looking for important details.

The photos above show how easy it really is. First, glitch triggering found a problem 50 μs into the data and positioned it center screen. Then with a simple twist of the time/div knob, MegaZoom™ shoots you right in for a closer look. Enjoy the benefits of deep memory, without the drawbacks.

HP 54645D Mixed Signal Oscilloscope/HP 54645A Oscilloscope

Scope channels			
Number of channels	2		
Bandwidth	100 MHz (75 MHz @ < 10 mV/div)		
Maximum sample rate	200 MSa/s		
Input impedance	1 MΩ, 12 pF		
Maximum input	400 V (dc + peak ac)		
Range	1 mV/div to 5 V/div		
Resolution	8 bits		
Peak detect	5 ns minimum		
Memory depth	1 M points/channel		
Coupling	ac, dc, gnd		
Logic channels (HP 54645D only)			
Number of channels	16 (two 8-channel pods)		
Maximum sample rate	400 MSa/s one pod only; 200 MSa/s both pods active		
Input R & C	100 kΩ, 8 pF		
Input level	+/- 40 V max, 500 mVp-p min		
Threshold range	+/- 6.0 volts in 50 mV increments		
Predefined thresholds	TTL (1.4 V), CMOS (2.5 V), ECL (-1.3 V)		
Peak detect	5 ns minimum		
Memory depth	2 M points/channel		
Timebase			
Range (main & delayed)	5 ns to 50 s/div		
Accuracy (nonvernier ranges)			
Scope, same channel	+/- 0.01% of reading +/- 0.2% of screen width +/- 40 ps		
Scope, channel to channel	+/- 0.01% of reading +/- 0.2% of screen width +/- 80 ps (200 ps)		
Logic, same channel	+/- 0.01% of reading +/- 0.2% of screen width +/- (1 logic sample period, 2.5 or 5 nsec) +/- chan-to-chan skew		
Logic, channel to channel	+/- 0.01% of reading +/- 0.2% of screen width +/- (1 logic sample period, 2.5 or 5 nsec) +/- chan-to-chan skew		
Triggering			
Sources	All channels and line		
Scope trigger modes	Edge, glitch, TV		
Logic trigger modes	Edge, pattern, glitch, advanced pattern		
Operators: And, Or Then, Entered, Exited, Duration time, Duration >, Duration <			
Size (excl. handle)	172 mm H x 322 mm W x 317 mm D (6.8 in x 12.7 in x 12.5 in)		
Weight	6.4 kg (15 lbs)		
Power	100-240 Vac, 45-440 Hz, 90 VA		
Ordering Information			
Options			
HP 54645D mixed signal oscilloscope	\$4,995.00 ea.	005 Enhanced TV/Video triggering	\$510.00 ea.
Includes two scope probes (HP 10074), one logic cable (HP 54620-61601), power cord, and manual		Trigger on specified video line number	
HP 54645A 100 MHz two-channel oscilloscope	3,495.00 ea.	101 HP 10098 Accessory pouch and front panel cover	51.00 ea.
HP 54650A HP-IB Interface module	485.00 ea.	103 HP 54645A Operator's training kit	204.00 ea.
HP 54652B RS-232/Parallel Interface module	485.00 ea.	104 5041-9409 Carrying Case	214.00 ea.
HP 54657A HP-IB Measurement/Storage module	765.00 ea.	1CM 5064-7345 Rack mount kit	260.00 ea.
HP 54659B RS-232/Parallel Measurement/Storage module	765.00 ea.	106 HP 34810A BenchLink Scope software for windows (HP BenchLink version 1.4 or later)	295.00 ea.

We're ready to help with the mixed-signal future.

Other aspects of the future may seem hazy, but one point at least is clear: Designers of almost every kind of consumer and industrial product imaginable are going to have to deal with mixed-signal circuits and systems. We've been tracking this development for several years and are ready with the tools to help you succeed with these new design concepts.

Count on HP's experience.

As the long-time leader in logic analysis and a continuing innovator in oscilloscope technology, HP is uniquely positioned to deliver mixed-signal solutions. By incorporating input from users like you all over the world, we're creating new solutions to your evolving test and measurement needs.

More than just measurements.

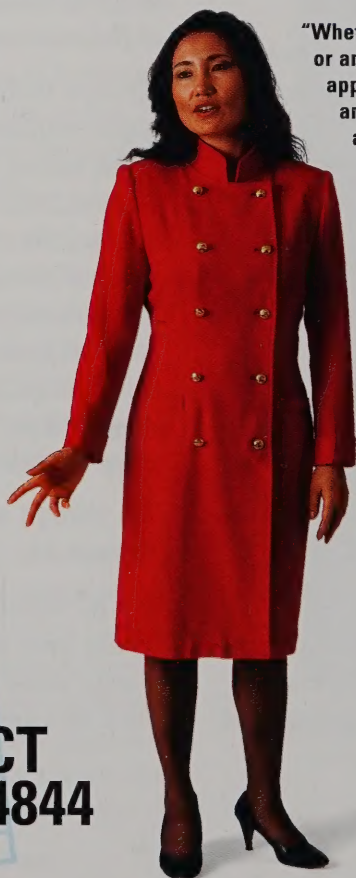
At HP DIRECT, we know that your success requires more than just measurements. You also need the right information, the right accessories and the right support. We offer the entire package. When you have demanding technical questions, you'll talk to an experienced engineer who understands mixed-signal measurements.

Call HP DIRECT today, and together we'll make a successful move into the future.

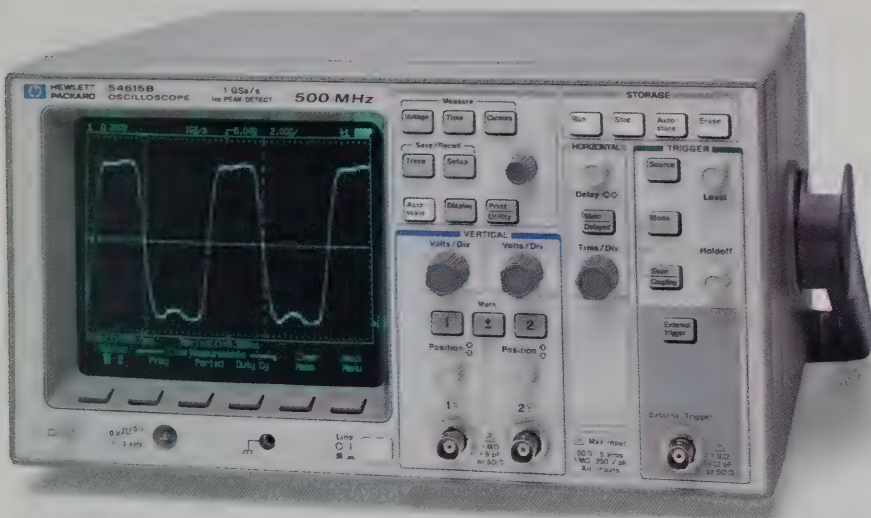


**HEWLETT®
PACKARD**

**"Whether it's mixed-signal
or any other demanding
application, give me a call
and we'll find the right
answer for your needs."**



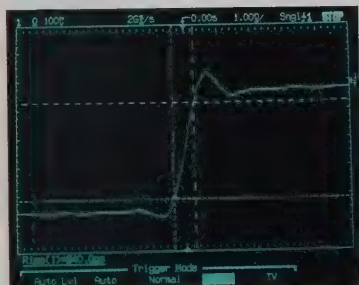
**HP DIRECT
1-800-452-4844**



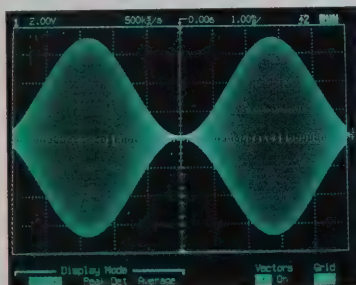
\$5,595
(HP 54615B)

Those elusive signals are running out of places to hide.

With the HP 54615B and 54616B 500 MHz two-channel digital scopes, you'll finally have the tools you need to catch those nasty little glitches and other signals that have been wreaking havoc in your circuits.



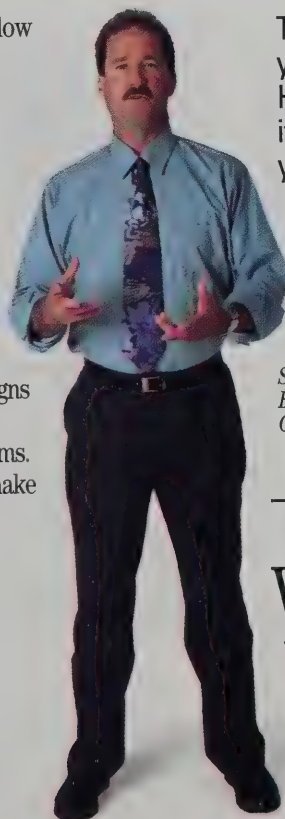
With single-shot bandwidths as high as 500 MHz, you'll see those important details on high-speed dynamic signals.



Fast update rates and variable screen intensity help you interpret complex signals.

- The HP 54615B samples at 1 GSa/s per channel, and the new HP 54616B samples at 2 GSa/s per channel, so you'll see those key details — even on fast, dynamic signals.
- Their multiprocessor design accelerates display updates to show you more of your signal variations.
- No matter how slow you sweep, the HP 54615B/16B's digital peak detect can still pick up glitches as narrow as 1 ns.

The result is a new level of power for characterizing designs and solving tough engineering problems. And these prices make it even easier.



Meeting your measurement challenges.

Putting a reliable trace on the display is just the first step in designing a great scope these days. With all the time and budget pressures you face, you can use all the help you can get. That's what the HP 54600-series scopes are all about.

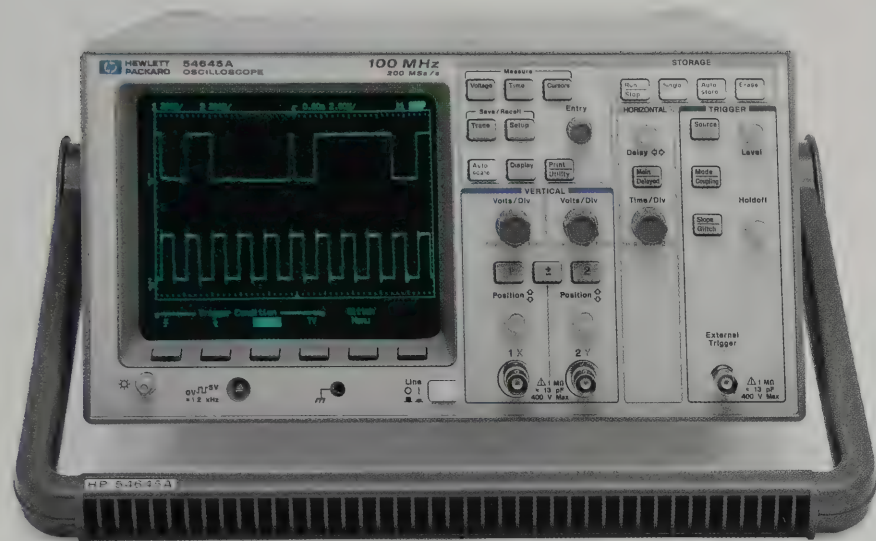
To help you solve problems faster, we packed three processors in these scopes so they can deliver answers faster — without the delays that make single-processor scopes so frustrating to use.

To help you get the most from your scope investment, enhancement modules let you expand your capabilities without buying a new scope. Read all about these measurement, storage and automation features on page 8.

To help you work with your measurement results, HP BenchLink Scope makes it easy to move data from your scope to a PC and to all the analysis, documentation and presentation tools available in Microsoft Windows. See page 30 for details.

Scott DeBenning
BSEE
California State University

Within budget, without compromise.



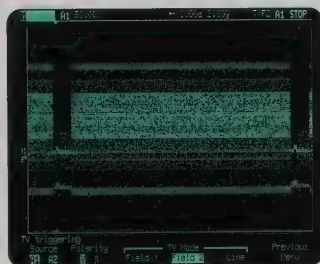
\$3,495

Deep-memory without the painful memories.

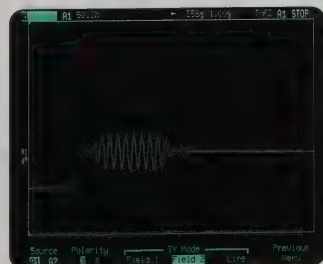
The advantages of a deep-memory scope are clear: You can capture long streams of wide-bandwidth data, then scroll back through looking for details. Unfortunately, the disadvantages are just as clear: These scopes are expensive and too sluggish for real-time troubleshooting.

The new HP 54645A 100 MHz two-channel scope delivers deep memory without the drawbacks. With 200 MSa/s sampling and a display update rate of 3 million points/second, it's both fast and responsive. With HP's MegaZoom™ technology, you can store up to a million sample points on each channel.

The HP 54645A's pan & zoom feature makes it easy to scroll through captured data. This is a great tool when you don't know enough about the signal to set up triggering and for capturing widely spaced events. So call the engineers at HP DIRECT and find out how you can get the power — without the pain.



MegaZoom's deep memory capacity makes it easy to capture an extensive block of data, such as this frame from a video signal.



Then to explore the details, you simply turn the time/div knob to zoom in and find what you're looking for. Here's a single line's color burst.

The future is already here.

Don't worry.
So are the new test tools you'll need.

When you're creating next-generation products, the last thing you need to worry about is how you're going to test those innovative new designs.

Stick with HP and you won't have to worry. We'll be there to meet your test needs, no matter where markets and technologies take you.

Want proof? The new HP 54645D mixed signal oscilloscope seamlessly integrates analog and digital measurements, and the HP 54645A two-channel scope combines the fast response of a troubleshooting scope with the storage of a deep-memory scope. Turn the page to see how these unique tools can help you.



We're ready to help with the mixed-signal future.

Other aspects of the future may seem hazy, but one point at least is clear: Designers of almost every kind of consumer and industrial product imaginable are going to have to deal with mixed-signal circuits and systems. We've been tracking this development for several years and are ready with the tools to help you succeed with these new design concepts.

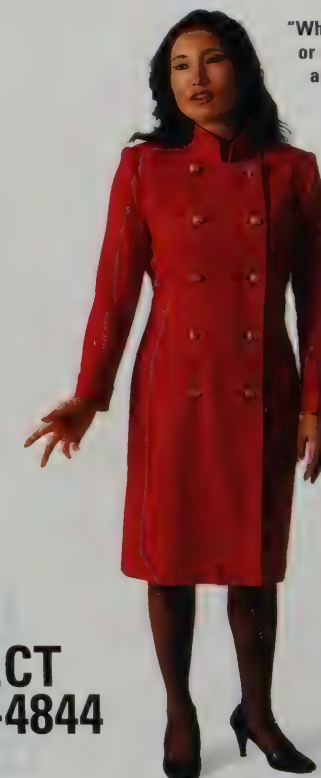
Count on HP's experience.

As the long-time leader in logic analysis and a continuing innovator in oscilloscope technology, HP is uniquely positioned to deliver mixed-signal solutions. By incorporating input from users like you all over the world, we're creating new solutions to your evolving test and measurement needs.

More than just measurements.

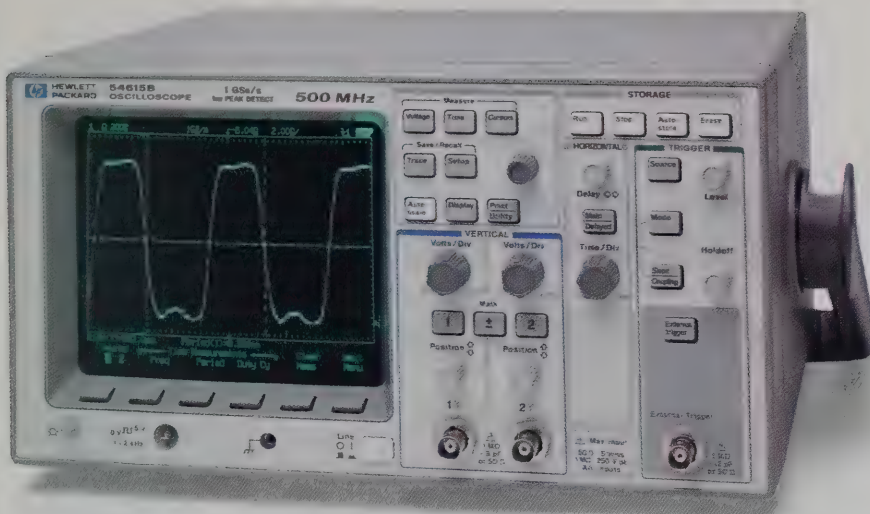
At HP DIRECT, we know that your success requires more than just measurements. You also need the right information, the right accessories and the right support. We offer the entire package. When you have demanding technical questions, you'll talk to an experienced engineer who understands mixed-signal measurements.

Call HP DIRECT today, and together we'll make a successful move into the future.



"Whether it's mixed-signal or any other demanding application, give me a call and we'll find the right answer for your needs."

HP DIRECT
1-800-452-4844



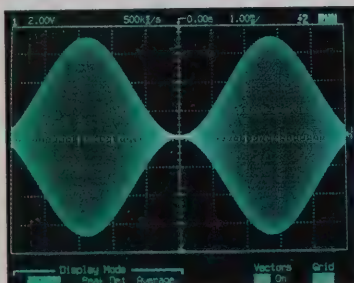
\$5,595
(HP 54615B)

Those elusive signals are running out of places to hide.

With the HP 54615B and 54616B 500 MHz two-channel digital scopes, you'll finally have the tools you need to catch those nasty little glitches and other signals that have been wreaking havoc in your circuits.



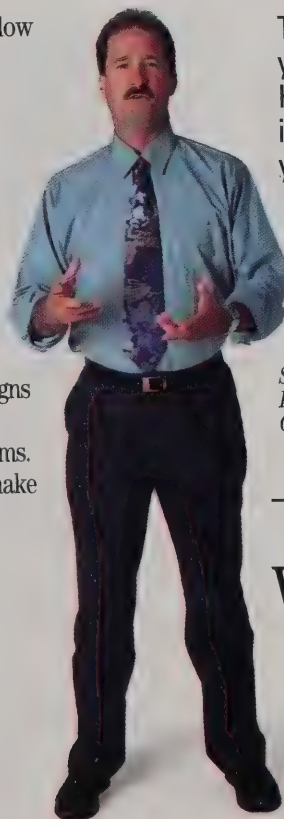
With single-shot bandwidths as high as 500 MHz, you'll see those important details on high-speed dynamic signals.



Fast update rates and variable screen intensity help you interpret complex signals.

- The HP 54615B samples at 1 GSa/s per channel, and the new HP 54616B samples at 2 GSa/s per channel, so you'll see those key details — even on fast, dynamic signals.
- Their multiprocessor design accelerates display updates to show you more of your signal variations.
- No matter how slow you sweep, the HP 54615B/16B's digital peak detect can still pick up glitches as narrow as 1 ns.

The result is a new level of power for characterizing designs and solving tough engineering problems. And these prices make it even easier.



Meeting your measurement challenges.

Putting a reliable trace on the display is just the first step in designing a great scope these days. With all the time and budget pressures you face, you can use all the help you can get. That's what the HP 54600-series scopes are all about.

To help you solve problems faster, we packed three processors in these scopes so they can deliver answers faster — without the delays that make single-processor scopes so frustrating to use.

To help you get the most from your scope investment, enhancement modules let you expand your capabilities without buying a new scope. Read all about these measurement, storage and automation features on page 8.

To help you work with your measurement results, HP BenchLink Scope makes it easy to move data from your scope to a PC and to all the analysis, documentation and presentation tools available in Microsoft Windows. See page 30 for details.

Scott DeBenning
BSEE
California State University

Within budget, without compromise.

HP 54600-series scopes

A scope that's ideal for your application and budget.

One message always comes through loud and clear from our customers: you're tired of having to choose between excellent features and performance at a reasonable price. You want it all.



HP 54602B

- 150 MHz bandwidth
- 4 input channels
- Sweep speeds from 2 ns/div to 5 s/div
- \$2,995

For a high-quality lab scope when your needs go past 100 MHz, take a closer look at the HP 54602B. You get the same capabilities as the other HP 54600-series scopes, with the added advantage of a 150 MHz bandwidth and 1 mV/div sensitivity.



HP 54610B

- 500 MHz bandwidth
- 2 input channels plus trigger view
- Sweep speeds from 1 ns/div to 5 s/div
- \$4,995

Need accurate 500 MHz measurements on a tight budget? We had you in mind when we designed the HP 54610B. With its horizontal accuracy of $\pm 0.01\%$ and 1 ns/div timebase, you know you'll catch the critical details.



HP 54615B/16B

- 500 MHz bandwidth
- 1 GSa/s (HP 54615B) 2 GSa/s (HP 54616B)
- 1 ns peak detect
- Starting at \$5,595

With 1 ns peak detect and 1 GSa/s (HP 54615B) or 2 GSa/s (HP 54616B) sampling, get the measurement power to solve tough engineering problems — and the easy, responsive feel of a troubleshooting scope.



HP 54601B

- 100 MHz bandwidth
- 4 input channels
- Sweep speeds from 2 ns/div to 5 s/div
- \$2,995

The HP 54601B offers tremendous value in a low-cost four-channel scope. When you need the added productivity and insight that come with four measurement channels, the HP 54601B offers an attractive blend of performance and capability.



HP 54600B

- 100 MHz bandwidth
- 2 input channels
- Sweep speeds from 2 ns/div to 5 s/div
- \$2,495

The HP 54600B is ideal for production test, field service, and education, where you need solid, dependable scopes at a low price. With prices this low, you can afford to equip your staff without sacrificing measurement capability or confidence in the results.



HP 54603B

- 60 MHz bandwidth
- 2 input channels
- Sweep speeds from 5 ns/div to 5 s/div
- \$1,995

Equipping a lab under tight budget restrictions used to mean giving up quality and capability. Not anymore. The HP 54603B delivers the features and performance you've always wanted. For colleges and universities, this scope is a great way to introduce students to the world of professional test equipment.

HP 54600B, HP 54601B, HP 54602B, HP 54603B, HP 54610B, HP 54615B and HP 54616B Oscilloscopes

	HP 54603B	HP 54600B	HP 54601B	HP 54602B	HP 54610B	HP 54615B/16B
Bandwidth CH 1 & 2 ac coupled CH 3 & 4	dc-60 MHz 10 Hz-60 MHz NA	dc-100 MHz 10 Hz-100 MHz NA	dc-100 MHz 10 Hz-100 MHz dc-100 MHz	dc-150 MHz* 10 Hz-150 MHz* dc-250 MHz	dc-500 MHz 10 Hz-500 MHz NA	dc-500 MHz 10 Hz-500 MHz NA
Single-shot bandwidth	dc-2 MHz	dc-2 MHz	dc-2 MHz	dc-2 MHz	dc-2 MHz	HP 54615B 250 MHz HP 54616B 500 MHz
Number of channels	2	2	4 (2 + 2)	4 (2 + 2)	2	2
Sensitivity CH 1 & 2 CH 3 & 4	2 mV/div to 5 V/div NA	2 mV/div to 5 V/div NA	2 mV/div to 5 V/div 0.1 & 0.5 V/div	1 mV/div to 5 V/div 0.1 & 0.5 V/div	2 mV/div to 5 V/div NA	2 mV/div to 5 V/div NA
dc gain accuracy	±2%	±1.5%	±1.5%	±1.5%	±2%	±2%
Rise time (calculated) CH 1 & 2 CH 3 & 4	<5.83 ns NA	<3.5 ns NA	<3.5 ns <3.5 ns	<2.33 ns <1.4 ns	<700 ps NA	<700 ps NA
Input impedance	1 MΩ, approx. 13 pF	1 MΩ, approx. 13 pF	1 MΩ, approx. 13 pF	1 MΩ, approx. 13 pF	1 MΩ, approx. 9 pF or 50 Ω selectable	1 MΩ, approx. 9 pF or 50 Ω selectable
Input coupling CH 1 & 2 CH 3 & 4	dc, ac or ground NA	dc, ac or ground NA	dc, ac or ground dc, ground	dc, ac or ground dc, ground	dc, ac or ground NA	dc, ac or ground NA
Maximum input (dc + peak ac)	400 V	400 V	400 V	400 V	250 V or 5 Vrms in 50 Ω mode	250 V or 5 Vrms in 50 Ω mode
Timebase range (main & delayed)	5 s/div to 5 ns/div	5 s/div to 2 ns/div	5 s/div to 2 ns/div	5 s/div to 2 ns/div	5 s/div to 1 ns/div	5 s/div to 1 ns/div
Trigger sources	CH 1, 2, line, or ext.	CH 1, 2, line, or ext.	CH 1, 2, 3, 4, or line	CH 1, 2, 3, 4, or line	CH 1, 2, line, or ext.	CH 1, 2, line, or ext.
Horizontal accuracy	±0.01%	±0.01%	±0.01%	±0.01%	±0.01%	±0.005%
Horizontal resolution	100 ps	100 ps	100 ps	100 ps	100 ps	20 ps
Trigger sensitivity dc to 25 MHz dc to max. bandwidth	0.35 div or 3.5 mV 1 div or 10 mV	0.35 div or 3.5 mV 1 div or 10 mV	0.35 div or 3.5 mV 1 div or 10 mV	0.35 div or 0.7 mV 1 div or 2 mV**	0.5 div or 2.5 mV*** 1 div or 5 mV†	0.5 div or 3.5 mV*** 1 div or 7 mV†
Maximum sample rate single shot repetitive	20 MSa/s 10 GSa/s	20 MSa/s 10 GSa/s	20 MSa/s 10 GSa/s	20 MSa/s 10 GSa/s	20 MSa/s 10 GSa/s	HP 54615 1 GSa/s HP 54616 2 GSa/s 10 GSa/s
Record length (maximum) single shot	4,000 points 2,000 points	4,000 points 2,000 points	4,000 points 2,000 points	4,000 points 2,000 points	4,000 points 2,000 points	5,000 points 5,000 points
Max. display update rate	1,500,000 points/sec	1,500,000 points/sec	1,500,000 points/sec	1,500,000 points/sec	1,500,000 points/sec	500,000 points/sec
Resolution	8 bits					
Power	Voltage: 100-240 Vac, 48-440 Hz, 300 VA maximum					
Net weight	Approx. 6.2 kg (14 lbs)					
Size (excl. handle)	172 mm H x 322 mm W x 317 mm D (6.8 x 12.7 x 12.5 in)					
Warranty	3 years					

Ordering information

HP 54600B Two-channel 100 MHz oscilloscope	\$2,495.00 ea.
HP 54601B Four-channel 100 MHz oscilloscope	2,995.00 ea.
HP 54602B Four-channel 150 MHz oscilloscope	2,995.00 ea.
HP 54603B Two-channel 60 MHz oscilloscope	1,995.00 ea.
HP 54610B Two-channel 500 MHz oscilloscope	4,995.00 ea.
HP 54615B Two-channel 500 MHz oscilloscope	5,595.00 ea.
HP 54616B Two-channel 500 MHz oscilloscope	6,595.00 ea.

Options

001 RS-03 Magnetic interference shielding added to CRT	\$102.00 ea.
002 RE-02 Display shield added to CRT to reduce radiated interference	355.00 ea.
005 Enhanced TV/video triggering (HP 54602/10B/15B/16B)	
Trigger on specified video line number	
Full bandwidth vertical out on rear panel	510.00 ea.
090 Delete probes (HP 54600/01/02/03B)	-112.00 ea.
090 Delete probes (HP 54610B/15B/16B)	-306.00 ea.
101 HP 10098A Accessory pouch and front panel cover	51.00 ea.

102 2 addl. HP 10071A probes (HP 54601/02B)	\$112.00 ea.
103 HP 54654A Operator's training kit	204.00 ea.
104 5041-9409 Carrying case	214.00 ea.
1CM 5062-7345 Rack mount kit	260.00 ea.
106 HP 34810A BenchLink Scope software (Windows)	295.00 ea.
(can also be ordered separately as HP 34810A)	
W50 Additional 2-year warranty, available for HP 54600-series oscilloscopes starting at††	60.00 ea.

* Maximum bandwidth on CH 1 & 2 is 100 MHz at 1, 2, and 5 mV/div.

** HP 54602B, for ranges 1, 2, and 5 mV/div, sensitivity between 25 MHz and 100 MHz on CH 1 & 2 is 2 div or 4 mV.

*** Trigger sensitivity from dc to 100 MHz.

† Trigger sensitivity from 100 MHz to max. bandwidth.

†† Call HP DIRECT for more information.

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Call HP DIRECT with your toughest scope questions.

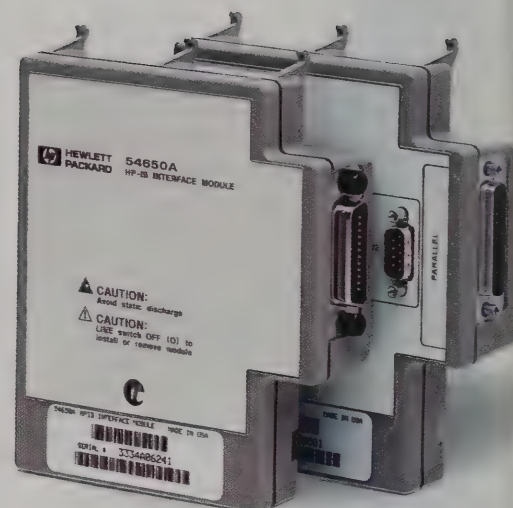
1-800-452-4844

P A G E

7

Boost scope performance without breaking your budget.

Modules range from **\$295** to **\$815**



Now upgrading your scope is easy — and easily affordable.

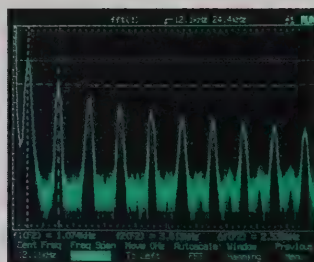
Transforming your HP 54600-series scope into a versatile test and measurement station is now as simple as popping on a module. It's easy to add direct hard copy, PC connectivity, RS-232 and parallel ports (depending on model), remote control, and advanced measurement capabilities such as fast Fourier transforms (FFT) and benchtop automation. You'll solve problems and boost productivity in ways that just aren't possible with ordinary scopes.

Put extra troubleshooting power in your lab.

For high-performance tools usually found only in much more expensive scopes — including the FFT to view signals in the frequency domain — add the HP 54657A (HP-IB) or HP 54659B (RS-232 and parallel) measurement/storage module. Common problems that are difficult or impossible to see in the time domain (such as harmonic distortion) are much easier to analyze in the frequency domain.

Get more from your oscilloscope.

1-800-452-4844

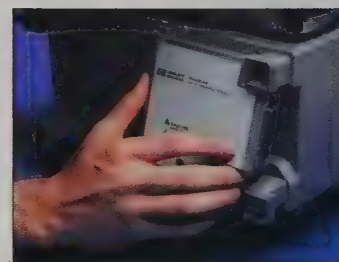


Turn on FFT, check in the frequency domain, and track down the cause of circuit failures.

Catch those intermittent failures.

With this module's unattended signal monitoring and failure detection features, you simply set up the scope and walk away. It will monitor the signal by comparison to a waveform mask template. When the failure mode appears, the scope will capture the signal, then follow your instructions for printing or storing the signal for later analysis.

The measurement/storage module provides other features to make your work easier, including measurements of channel-to-channel delay and phase, user-definable voltage levels for timing measurements, and extended math functions and cursor readouts.



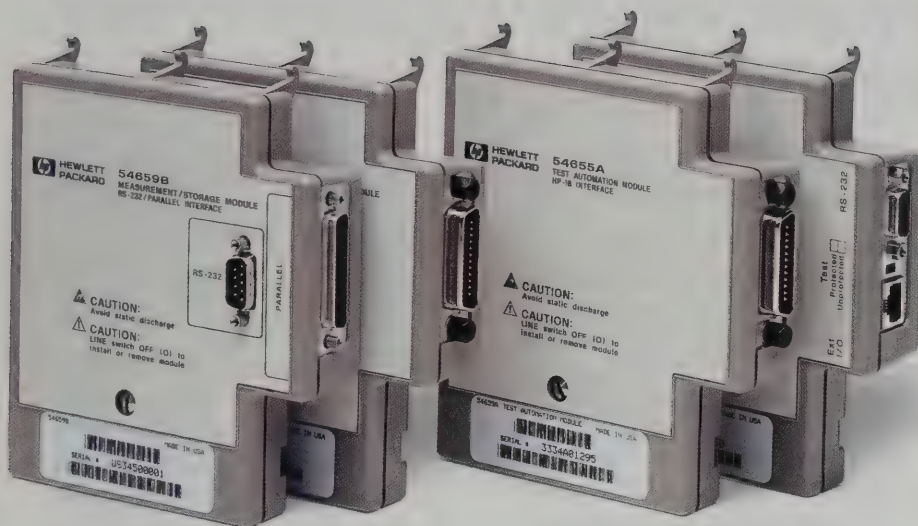
Add remote control and connectivity, including a PC link to use HP's BenchLink Scope.

Put system-style automation on your benchtop.

Think of how much time you'd save if you could program a scope to perform repetitive tasks at the touch of a button.

The HP 54655A (HP-IB) or HP 54656A (RS-232) test automation module makes it easy to set up automated tests — and you don't need a computer to do it. A built-in mask generator and editor lets you create a test routine of up to 100 steps. You can even use branching on pass/fail conditions to guide the operator through troubleshooting.

If all you need is an interface, add HP-IB with the HP 54650A, parallel with the HP 54652A, or both RS-232 and parallel connections with the HP 54652B.



HP 54600-series Scope Interface and Enhancement Modules

Ordering information

Product*	Description	Price
HP 54650A	HP-IB Interface module	\$485.00 ea.
HP 54652B	RS-232 & Parallel Interface module	485.00 ea.
HP 54655A	HP-IB Test Automation module	765.00 ea.
HP 54656A	RS-232 Test Automation module	815.00 ea.
HP 54657A	HP-IB Measurement/Storage module (see special offer below) ➤	765.00 ea.
HP 54659B	RS-232 & Parallel Measurement/Storage module (see special offer below) ➤	765.00 ea.
HP 34810A	BenchLink Scope software for Windows	295.00 ea.

Get connected for less! Only \$295 (until August 31, 1996)

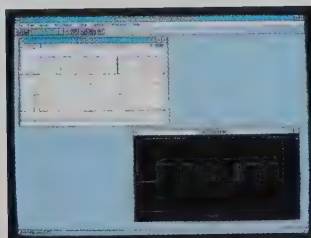
We've made it easy to add advanced measurements and PC connectivity:

- For HP-IB connections, the HP E2657A measurement/connectivity kit gives you the HP 54657A measurement/storage module, HP 34810A BenchLink software and HP 10833A HP-IB cable.
- For RS-232 connections, the HP E2659A kit provides the HP 54659B measurement/storage module, HP 34810A BenchLink software and the HP 34398A RS-232 cable.

*Modules with product numbers ending in "A" are compatible with HP 54600A-series and 54600B-series scopes. Modules ending in "B" are compatible with the HP 54600B-series only. (Note that the HP 54620A logic analyzer can use any of these modules, but it uses the modules for I/O only.)

Microsoft Windows is a U.S. trademark and MS-DOS is a registered trademark of Microsoft Corporation.

See page 33 for HP-IB and RS-232 cable needs.



To quickly move data and screen images to your PC, see the HP 34810A BenchLink Scope software on page 30.

Modules: the right product for your test environment.

Budgets are getting tighter but the pace of the 1990s hasn't slowed a step. The bottom line is you have to do more with the same resources as last year.

Add-on modules for the HP 54600-series scopes are another way HP is working to expand your resources without breaking your budget. Modules keep high performance affordable, whether you're buying a new HP 54600-series scope or upgrading an existing one. You can buy the scope with confidence, knowing that you can expand its capabilities as your needs grow.

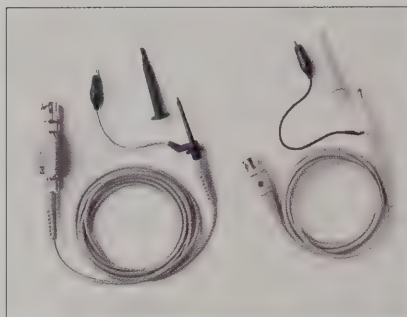
Give HP DIRECT a call, and we can tell you how to get more from less. We have a lot of hours in front of scopes ourselves, and we've helped customers with all kinds of scope applications. We'll show you how to maximize the performance and capability of your HP 54600-series scope — and make sure you get the right combination of modules and accessories.

Within budget, without compromise.

Need more on what modules will do for you? Call HP DIRECT.

1-800-452-4844

Great measurements start with great connections.



Connect to your circuits with top-quality probes.

Complete your test setup with probes designed specifically for your HP 54500-series or HP 54600-series scope. The HP 10400-series miniature probes combine low capacitance with high performance. The HP 10070-series are rugged general-purpose probes for the HP 54600-series

scopes. They offer 1:1 or 10:1 division ratios, as well as a 500 MHz probe designed for the HP 54610B scope. For high-voltage measurements, the HP 1137A handles up to 5 kV.

HP Scope Probes

Product	Typical bandwidth	Probe type	Length (incl. cable)	Division ratio	Input resistance	Approximate shunt capacitance	Scope compatibility	Price
HP 10070A	20 MHz	Passive	1.5 m	1:1	1 M Ω	70 pF	HP 54600/01/02/03B	\$56.00 ea.
HP 10071A	150 MHz	Passive	1.5 m	10:1	10 M Ω	15 pF	HP 54600/01/02/03B	56.00 ea.
HP 10073A	500 MHz	Passive	1.5 m	1:1	10 M Ω	12 pF	HP 54610B	153.00 ea.
HP 10430A	500 MHz	Passive	1 m	10:1	1 M Ω	6.5 pF	HP 54500-series	179.00 ea.
HP 10437A	1 GHz	Passive	2 m	1:1	50 Ω	NA	Scopes with 50 Ω inputs	128.00 ea.
HP 10438A	80 MHz	Passive	1 m	1:1	High Z	40 pF	Scopes with high-Z inputs	102.00 ea.
HP 10441A	500 MHz	Passive	2 m	10:1	1 M Ω	9 pF	HP 54500-series	179.00 ea.
HP 10442A	1 GHz	Passive	2 m	10:1	500 Ω	1.2 pF	Scopes with 50 Ω inputs	138.00 ea.
HP 10444A	500 MHz	Passive	1.6 m	10:1	1 M Ω	9 pF	HP 54610B	179.00 ea.
HP 1141A*	200 MHz	Differential	1.5 m	1:1/10:1/100:1	1 M Ω /9 M Ω /10 M Ω	7 pF/3.5 pF/2 pF	HP 54600/54500	1,710.00 ea.
HP 1137A	1 MHz	5 K High Voltage	1.5 m	1000:1	500 M Ω	3 pF	Scopes with 1 M Ω inputs	209.00 ea.

*One HP 1142A power supply needed - \$835.00 ea.

The right accessories to be more productive.

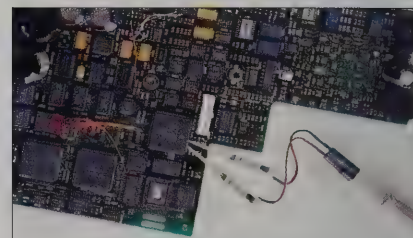


HP Accessories

Product	Description	Price
HP 10072A	SMT kit for HP 10070-series probes; includes 10 SMT lead grabbers	\$66.00 ea.
HP 10450A	SMT kit for HP 10400-series probes; includes 10 SMT lead grabbers	82.00 ea.
HP 5081-7705	BNC adapter for HP 10070-series probes	28.00 ea.
HP 10100C	50 Ω Feedthrough termination BNC	56.00 ea.
HP 11094B	75 Ω Feedthrough termination BNC	37.00 ea.
HP 10110B	Dual banana to BNC (m) adapter	27.00 ea.
HP 1251-2277	Dual banana to BNC (f) adapter	15.50 ea.
HP 1183A	Testmobile scope cart for HP 54600-series scopes	495.00 ea.
HP 34397A	dc-to-ac inverter	160.00 ea.

Tired of hauling around your scope?

Make your job easier and safer with the HP 1183A Testmobile, an economical cart custom-fitted for the HP 54600-series scopes.



The SMT kits include 10 SMT lead grabbers for fine-pitch circuitry.

Boost your measurement productivity with the right accessories.

1-800-452-4844

HP logic analyzers

Troubleshooting and design tools for a world gone digital.

Can you face the future with just your scope?

It wasn't too many years ago that digital systems were the exception, not the rule. When you did run into digital circuits, you could conquer most of them with your trusty old scope.

Today, when even toasters have gone digital, it's a different story. Increasingly complex digital systems are everywhere, and your scope is having a hard time keeping up. Scopes are designed to provide a lot of detailed information about a small number of signals — just the opposite of what most digital measurements require.

The right tools for the digital world.

In more and more situations, the right answer is to team your scope up with a logic analyzer. True logic analysis can make troubleshooting faster and more successful. You'll have the channels you need (from 16 to 136 or more), and you'll have the sequential and pattern triggering to isolate key events easily.

Logic analysis isn't what it used to be.

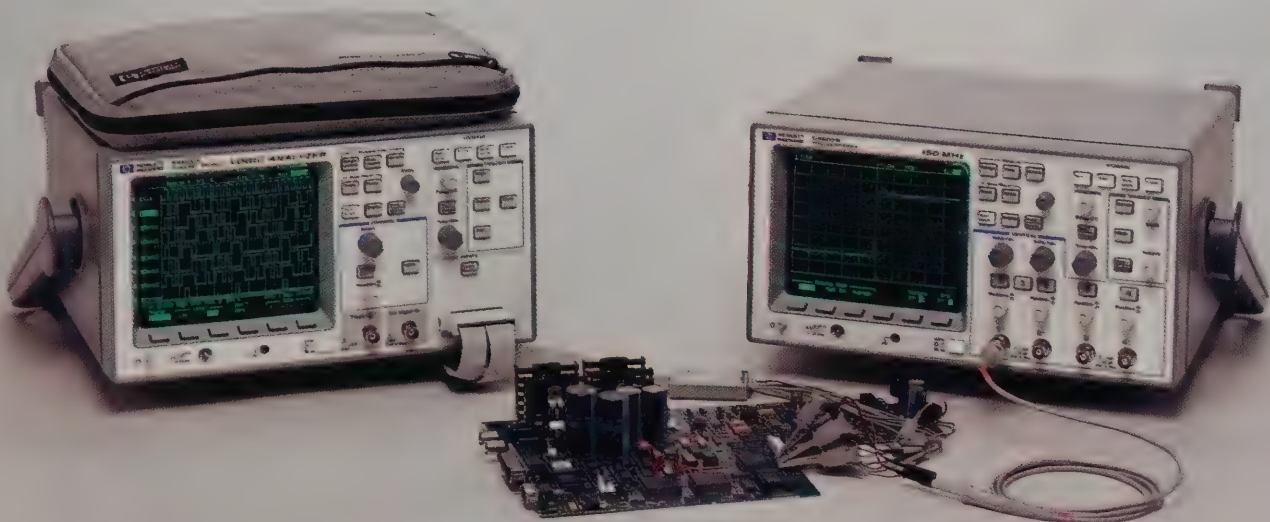

We realize logic analyzers don't have a great reputation for cost-effectiveness or ease of use. Sure, if you designed processor-based systems all day long, it made sense to invest the time and money in a logic analyzer. If you needed a tool for occasional troubleshooting, however, a good scope was the sensible solution for logic analysis. Having only a few channels and limited triggering was a compromise, but at least your scope was easy to use.

Time to stop compromising, don't you think?

Now you can enjoy the benefits of logic analysis without all the learning and relearning. For quick troubleshooting on a wide variety of circuits and systems, the HP 54620A/C logic analyzer offers 500 MSa/s timing analysis on 16 channels, with the triggering you need to catch elusive events. And it's as easy to use as your scope — in fact, it's built on a scope platform, so you'll feel right at home right away.

For design and advanced troubleshooting of embedded microprocessor systems, the HP 1664A logic analyzer delivers both timing and state analysis. In other words, you not only see when things happen, you see what happens, too. You no longer have to guess what the hardware and software are up to. And the low price means you no longer have to do without this kind of power, either.

*See the HP 54620A/C on page 12
and the HP 1664A on page 14 —
and see how easy
logic analysis
can be today.*



Scopes give you lots of detailed information about a few signals; logic analyzers give you quick status reports on a dozen or more signals at once. Successfully troubleshooting many of today's digital systems requires both approaches.

Looks like a scope, feels like a scope. Must be HP's newest logic analyzer.

For all those times you use a scope as a logic analyzer.

When you were growing up, didn't somebody always lecture you about using the right tool for the job? So why are you using a scope for those jobs where a logic analyzer is the right tool? Like piecemealing your way through an eight-line logic problem when you have only four channels. Or tracking down a glitch that's hiding in a timing sequence far too complex for your scope's triggering abilities.

We know why, because you've been telling us loud and clear. You'd use logic analyzers if they were less expensive, easier to learn, easier to set up, and easier to operate. In other words, if they were more like scopes.

Imagine: 16 channels of logic analysis, powerful triggering, and operation like a scope.

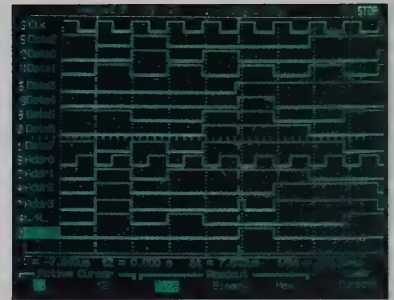
Think how easy it would be to troubleshoot complicated digital and mixed-signal circuits if you had 16 channels of powerful logic analysis and the ability to trigger on edges, patterns, duration times, and sequences.

The 500 MSa/s sampling rate gives you the power to catch the nastiest glitches. And you'll view the results on a sharp, high-speed display with an update rate of up to 15 screens per second, regardless of the number of active channels.

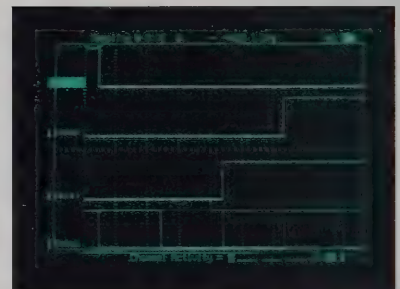
Add automatic measurements of frequency, period, duty cycle, width, delay and hold

It's a whole
new way to
look at logic.

1-800-
452-4844



You've never done this on a logic analyzer — all active signals on the display, scaled for easy viewing, all with just one press of the Autoscale button.



Catch unstable and transient events, just like you would on your scope.

time, and you'll be ready to troubleshoot with speed and confidence.

For the ultimate in signal investigation, team the HP 54620A or HP 54620C with your scope, using the logic analyzer's advanced triggering to control the scope.



Get the familiar feel of a scope, with the triggering and channel count you need for complex digital troubleshooting.

Starting at
\$2,995



HP 54620A/C Logic Analyzer

Timing channels Input R & C Maximum input	16 numbered 0–15 (all simultaneous) Approximately 100 k Ω and 8 pF ± 40 V	Minimum input Threshold range	500 mVp-p about threshold ± 6.0 V
Timebase range (main and delayed)	1 s/div to 5 ns/div		
Timebase accuracy	0.01% of reading		
Timebase cursor accuracy Single channel Dual channel	\pm (sample period + 0.01% of reading + 0.2% of screen width) \pm (sample period + 0.01% of reading + ch-ch skew + 0.2% of screen width)		
Maximum sample rate	500 MSa/s		
Record length	2 k for sample period ≥ 8 ns (sweep speeds of 1 μ s/div to 1 s/div), 8 k for all other sweep speeds, and when auto glitch is disabled		
Glitch detect	Automatically activated when sampling period is slowed to be > 4 ns (1 μ s/div and slower). Minimum detectable glitch: 3.5 ns		
Triggering sources	All channels and external		
Auto/normal operation Autotrigger Normal	Free-running display if trigger not found Analyzer will wait indefinitely for trigger		
Modes	Edge, pattern, advanced (2 pattern and edge terms). Advanced operators: And, Or, Then, Entered, Exited, Duration ($< >$) time, Occurs N times		
Setup functions	Autoscale, 16 saved setups, 2 trace memories, channel labeler (with 75 preset and user-defined labels)		
Interface	Compatible with HP 54650A, HP 54651A, and HP 54652B interface modules, and HP 34810A BenchLink Scope software		
Net weight	6.8 kg (15 lbs)		
Size	172.7 mm H x 322.6 mm W x 317.5 mm D (6.8 x 12.7 x 12.5 in)		
Warranty	3 years		
Ordering information			
HP 54620A 16-channel logic analyzer	\$2,995.00 ea.	HP 34397A dc-to-ac inverter	\$160.00 ea.
HP 54620C 16-channel logic analyzer	3,995.00 ea.	Opt. 104 5041-9409 Carrying case	214.00 ea.
Opt. 101 Accessory pouch and front panel cover	51.00 ea.	Opt. 106 HP 34810A BenchLink Scope software	295.00 ea.
Opt. 103 54654A Operator's training kit	204.00 ea.	Opt. 1CM 5062-7345 Rack mount kit	260.00 ea.

Did you know you can use BenchLink Scope to connect the HP 54620A to a PC? See page 30 for details.

Easy like your scope — and color makes it even easier.

You want to make measurements, not spend time learning how to operate a new instrument. That's why the HP 54620A and 54620C look, feel and run like scopes, from the familiar knobs to the one-button Autoscale feature.

And with the HP 54620C's full-color active matrix LCD display, you can simplify your analysis even more by highlighting particular signals or grouping sets of signals by color. It all adds up to an easier — and faster — way to get the job done.

Admit it, you're skeptical.

When the design team first came to us with prototypes, we were skeptical, too. Then we tried it. This logic analyzer is so much like a scope that it's actually fun to use!

How did they do it? The high-throughput architecture and custom display processor of our HP 54600-series scopes provide the fast display updates and instant front panel response. And we use HP's unique "logic analyzer on a chip" — a 1.2 million transistor powerhouse — to handle the data acquisition.

Imagine what this can do for your troubleshooting. And then give us a call at HP DIRECT. We'll be happy to tell you exactly how it can be done.



How's this possible? It's easy. Let us show you how.

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Only \$4,600

Pick the mode of control that's fastest for you: front-panel, mouse, or PC-style keyboard.

HP logic analyzers

Don't let digital design problems destroy your schedule — or your budget.

Start with the right tools to solve problems in a hurry.

Whether you need to trouble-shoot hardware, verify bus operation, or debug software, the HP 1664A logic analyzer offers comprehensive state and timing analysis and the advanced triggering you need for complex digital systems.

A streamlined design for fast answers.

Design problems are hard enough — don't choose a logic analyzer that makes things even worse. From the sensibly organized menus to the graphical trigger display that helps you set up any trigger sequence, the HP 1664A gets you to the solution sooner.

Having both state and timing analysis lets you see problems from more than one angle as you investigate signal timing, data flow or code execution. The chart mode converts streams of data into visual information, and the compare mode

Cut your digital design time.

1-800-
452-4844

makes it easy to check prototypes against a verified master board. And the built-in disk drive lets you transfer data or graphics files to a PC for documentation or further analysis.


The performance to stay ahead of your latest designs.

Choose conventional timing mode for resolution down to

2 ns or transitional timing mode to analyze bursts of data as far as 34.3 seconds apart and up to 9.7 hours long. Transitional timing offers 8 ns resolution at 125 MHz on all channels or 4 ns on half channels, and the glitch timing mode detects intermittent signals as brief as 3.5 ns.

Problems can't hide from this full-featured trigger.

When problems are buried under layers of logic, you need triggering tools to dig down and root them out. The HP 1664A can trigger on timeout violations in real-time

Analyzer					Listing IEEE 488					Save													
Markers		Find		-1		from		Specify															
Pattern		X-pattern				Trigger		Pattern															
		ACQ								HP Inverse assembler for HP1B				Time									
Hex		ATN								Memoric		HEX		EOI		SPD		REN		TFC		Absolute	
-6		DFAF		P		50																-19.20	
		DFA4		<ESC>		1B																-2.242	
-4		XDFD9		A		26																-2.095	
-3		DFD4		K		68																-1.909	
-2		DFCF		O		30																-1.674	
-1		DFAC		S		55																-1.375	
0		DFDF		space		20																0	
1		DFDF		space		20																155.0	
2		DFDF		space		20																745.0	
3		DFB8		D		44																1.350	
4		DFB8		I		49																1.910	
5		0DFAC		S		55																2.556	
6		DFB8		K		40																3.680	
7		DFDF		space		20																4.287	
8		DFB8		D		44																4.856	
9		DFB8		I		49																	

Tracing software execution and untangling bus communication are just two uses of the powerful state analysis tool.

applications and trace intricate algorithms. Twelve sequence levels for state triggering and ten levels of timing triggering make it possible to store or trigger on complex event series.

HP 1664A Logic Analyzer

State and timing channels		34	
Memory depth/channel		4 K per channel, 8 K in half-channel mode	
Timing analysis			
Conventional mode		250 MHz all channels 500 MHz half channels	
Transitional mode		125 MHz all channels 250 MHz half channels	
Glitch mode		125 MHz half channels	
Sample period accuracy		±0.01% of sample period	
Channel-to-channel skew		2 ns typical, 3 ns maximum	
Minimum detectable glitch		3.5 ns	
State analysis			
Maximum speed ¹		50 MHz	
State clocks/qualifiers		2	
Setup/hold time ²		0/3.5 ns through 3.5/0 ns, adjustable in 500 ps increments	
Minimum state clock pulse width		3.5 ns	
Time tag resolution ³		8 ns or 0.1% (whichever is greater)	
Max. time count between states		34.4 s	
Max. state tag count ³		4.29 × 10 ⁹ states	
Triggering			
Timing sequence levels		10	
State sequence levels		12	
Pattern recognizers		10	
Range recognizers		2, each 32 bits wide	
Edge/Glitch recognizers		2 (timing mode only)	
Max. occurrence counter value		1,048,575	
Timers		2	
Timer value range		400 ns to 500 s	
Probes			
Input resistance		100 kΩ, ±2%	
Input capacitance		~8 pF	
Minimum voltage swing		500 mVp-p	
Threshold range		±6.0 V, adjustable in 50 mV increments	
Input/Output			
I/O Ports		Centronics, RS-232, HP-IB and HIL for mouse and keyboard (optional)	
External arming		Input and output BNC connections with TTL signal levels	
Programmability		Fully programmable via RS-232 or HP-IB interface	
Mass storage		High-density, DOS/LIF format, 1.44 MB flexible disk drive	
File types		TIFF, PCX and PostScript screen image files, ASCII data files and binary-encoded data/configuration files	
Physical factors			
Dimensions		218 mm H x 440 mm W x 367 mm D (8.6 x 17.3 x 14.5 in)	
Weight		~11.8 kg (26 lbs)	
Warranty		1 year	
Ordering information			
HP 1664A 34-channel logic analyzer	\$4,600.00 ea.	HP E2427A HIL Keyboard kit	\$195.00 ea.
Opt. OB5 Service manual	55.00 ea.	HP 1180B Testmobile	290.00 ea.
Opt. UK9 Front panel cover	40.00 ea.	HP 35183A Work surface for HP 1180B	50.00 ea.
Opt. 1CM Rack mount kit	305.00 ea.		

¹Maximum state analysis speed does not change when time tags or state tags are used.

²Minimum setup/hold window is specified for single-edge, single-clock acquisition. Single-clock, multi-edge setup/hold window is 4.0 ns. Multiclock, multi-edge setup/hold window is 4.5 ns.

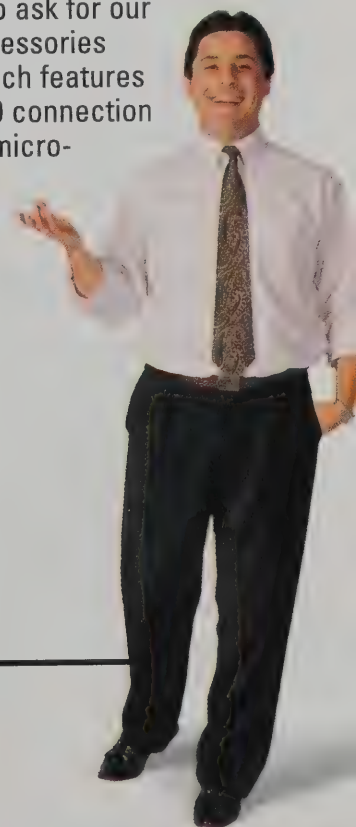
³Use of time tags or state tags will halve the memory depth.

A solution for every digital design.

With all the customers we talk to, we know how diverse the field of digital design really is. The good news is that HP has a solution for virtually every digital application, from industrial automation to general-purpose computing.

The HP 1664A you see here is just one of the products in the HP 1660-series. Other analyzers in the family offer up to 136 channels, simultaneous state and timing analysis, and 100 MHz state analysis speed, giving you the power to handle the newest 32-bit designs. Some even provide built-in oscilloscopes to give both digital and analog views of suspect signals.

The engineers here at HP DIRECT are ready to answer your logic analysis questions — and be sure to ask for our free logic accessories brochure, which features more than 200 connection solutions for micro-processors and data buses.



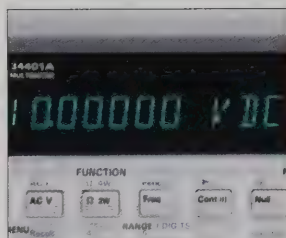
We'll make sure you get the right digital tools.

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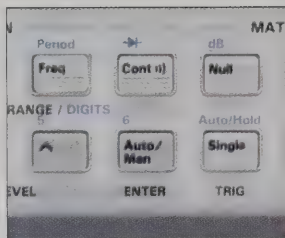
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accuracy
at a 5½
digit price.



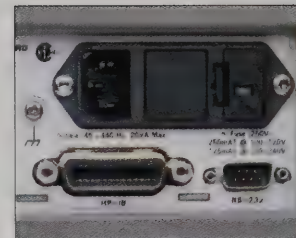
Only \$995



6½ digits means
you'll catch
details that other
DMMs can't.



All the measure-
ments you expect,
plus features that
make checkout on
the bench easy.



Both HP-IB and
RS-232 interfaces
are standard.

If you can find another DMM this accurate, it won't be this affordable.

Getting accuracy in a digital multimeter (DMM) used to mean spending big. Not anymore. For what you'd expect to pay for a 5½ digit DMM, you can now get the top-quality 6½ digit HP 34401A.

If people depend on you, depend on your HP 34401A.

With 6½ digits, you'll catch details that hide from lesser DMMs. And rest easy, knowing that the last measurement of the day will be as accurate as the first: 24-hour accuracy is 0.0015% for dc volts and 0.06% for ac.

The highest-
value meter in its
class. Call:

1-800-
452-4844

Not just more features —
more productivity.

Packing a DMM with features is fairly easy, but making those features work for you is another story. The HP 34401A boosts your productivity by combining time-saving features with an easy-access user interface. One or two button presses give you a wide array of functions, from dc volts to frequency to dB and dBm. Advanced tests include limit checks that can drive a TTL output, min/max/avg readouts, and dc voltage ratios.

Plus, the HP 34401A offers up to 1,000 readings per second and 50 range changes every second. You'll save time putting the HP 34401A into a system, too. Standard Commands for Programmable

Instruments (SCPI), HP 3478A, and Fluke 8840/8842A command languages are built in, so you won't have to rewrite your existing test software.

For a giant productivity leap, check out HP 34812A BenchLink Meter. This low-cost software package gives you graphing, basic statistics and data storage — with no programming.

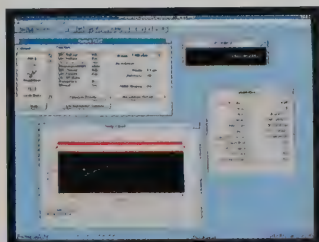
Chances are, you'll retire before it does.

Unlike the short warranties on other DMMs, we back the HP 34401A for a full three years. (The secret behind our confidence: a mean-time-between-failure rating of 150,000 hours!)

HP 34401A Multimeter

Range	Resolution: 6½ digits (or freq. for ac volts)	Accuracy: 1 year ±(% of reading + % of range)	
dc voltage			
100 mV	100 nV	0.0050 + 0.0035	<u>Input resistance</u> 10 MΩ or >10 GΩ
1 V	1 μV	0.0040 + 0.0007	10 MΩ or >10 GΩ
10 V	10 μV	0.0035 + 0.0005	10 MΩ or >10 GΩ
100 V	100 μV	0.0045 + 0.0006	10 MΩ
1000 V	1 mV	0.0045 + 0.0010	10 MΩ
True rms ac voltage			
100 mV	3 Hz–5 Hz	1.00 + 0.04	
	5 Hz–10 Hz	0.35 + 0.04	
	10 Hz–20 kHz	0.06 + 0.04	
	20 kHz–50 kHz	0.12 + 0.04	
	50 kHz–100 kHz	0.60 + 0.08	
	100 kHz–300 kHz	4.00 + 0.50	
	3 Hz–5 Hz	1.00 + 0.03	
	5 Hz–10 Hz	0.35 + 0.03	
	10 Hz–20 kHz	0.06 + 0.03	
	20 kHz–50 kHz	0.12 + 0.05	
for 1 V–750 V ranges	50 kHz–100 kHz	0.60 + 0.08	
	100 kHz–300 kHz	4.00 + 0.50	
Resistance			
100 Ω	100 μΩ	0.010 + 0.004	<u>Current Source</u> 1 mA
1 kΩ	1 mΩ	0.010 + 0.001	1 mA
10 kΩ	10 mΩ	0.010 + 0.001	100 μA
100 kΩ	100 mΩ	0.010 + 0.001	10 μA
1 MΩ	1 Ω	0.010 + 0.001	5 μA
10 MΩ	10 Ω	0.040 + 0.001	500 nA
100 MΩ	100 Ω	0.800 + 0.010	500 nA
dc current			
10 mA to 3 A ranges			
ac current			
1 A to 3 A ranges			
Frequency and period			
3 Hz (0.333 sec) to 300 kHz (3.33 μsec)			
Continuity			
1000 Ω range, threshold variable from 1 Ω to 1 kΩ			
Diode test			
1 V range, 1 mA test current			
Math functions			
Null, min/max/avg, dBm, dB, limit test			
Other features			
Automatic reading hold, 512 readings storage, dcV-dcV ratio			
Maximum input			
dc and ac voltage 1000 Vdc, 750 rms ac dc and ac current 3 A, from <250 V source, double fused			
Shock and vibration			
meets MIL-T-28800D, Type III, Class 5			
Power			
100/120/220/240 V, 45–65 Hz, 360–440 Hz			
Net weight			
3 kg (6.5 lbs)			
Size			
88.5 mm H x 212.6 mm W x 348.3 mm D (4 x 8.5 x 14 in)			
Warranty			
3 years			
Ordering information			
HP 34401A Multimeter	\$995.00 ea.	HP 34130A Deluxe test lead set	\$35.00 ea.
Opt. 908 Rack mount kit	52.00 ea.	HP 34161A Accessory pouch	38.00 ea.
Opt. 910 Extra manual set	36.00 ea.	HP 34812A BenchLink Meter	295.00 ea.
Opt. W50 Additional 2-year warranty	45.00 ea.	HP 34397A dc-to-ac inverter	160.00 ea.

See page 33 for RS-232 and HP-IB cable needs.
Get the most from your meter! See pages 20–21 for probes and other accessories.

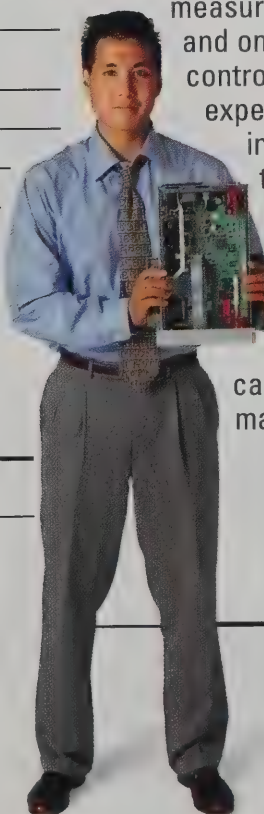


For a giant productivity leap, check out HP 34812A BenchLink Meter on page 31. This low-cost software package gives you graphing, basic statistics and data storage — with no programming.

The engineering that makes it possible.

HP's full line of multimeters lets us leverage our engineering efforts across multiple products. The HP 34401A DMM is a great example. The designers started with the analog-to-digital converter they'd created for the 8½ digit HP 3458A DMM and scaled these techniques for the 6½ digit HP 34401A. Compared to the ADC in the HP 3478A DMM (the HP 34401A's predecessor), the result is a fivefold increase in accuracy and a tenfold increase in linearity — from an ADC that costs 60% less.

The HP 34401A's speed comes from three microprocessors: one for the data bus, one for measurement and timing, and one for display and control. Plus, our in-house experts in large-scale integration created three all-new ICs that consume less board space, boost performance, and at the same time significantly lowered our manufacturing costs.



Mick Asawesna
BSEE
California State University

Specs? Performance issues? Call HP DIRECT.

1-800-452-4844

Putting benchtop features in the palm of your hand.

\$290

These compact multimeters will perform as well as your bench meter, without emptying your pockets.

The HP 970-series offers the basics and a whole lot more. Check out the high-resolution temperature function, the autodiode feature that automatically reverses polarity, and the min/max feature that alerts you when a minimum or maximum is recorded.

Rely on basic dc accuracy up to 0.05%, frequency response to 100 kHz, and true rms with ac + dc for higher accuracy on nonsinusoidal waveforms. Dig deep with resolution as tight as 10 μ V.

Measure with confidence, too. The innovative safety shutter prevents accidental connection to the current terminals, and all models feature high-energy fuses and overload alarms.



The protective boot keeps your handheld safe so you can focus on your work.



\$370

The HP 974A has the resolution of a $4\frac{1}{2}$ digit display and, unlike some other $4\frac{1}{2}$ digit handhelds, the accuracy to back it up.



The HP 973A gives you more ways to test and troubleshoot.

The $3\frac{1}{2}$ digit display (with 0.1% basic dc accuracy), 20 kHz frequency range, true rms, and ac + dc let you measure with confidence. Plus dBm and relative dB with dynamic range of 57 dB (2 mV to 400 mV) or 74 dB (0.2 V to 1000 V), with 0.1 dB resolution.

A convenient dual display makes it possible to view two digital readings simultaneously.



When extra precision is required, so is the HP 974A.

The HP 974A's $4\frac{1}{2}$ digit meter is as precise as you'll find, with a 49,999 count full scale.

Tough measurements? How about 100 kHz frequency response, true rms, ac + dc, and basic dc accuracy of 0.05% for all ranges.

\$245

Measure low-level signals with the HP 972A.

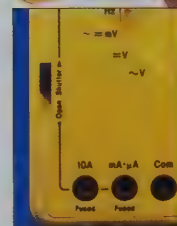
When you're chasing small signals, you'll appreciate 40 mV ranges for dc/ac voltage and the assurance of 20 kHz frequency response. And forget about using a dedicated capacitance tester: the HP 972A handheld multimeter can measure from 10 nF to 1000 μ F.



\$195

When things tend to get bumped and broken, there's no better handheld than the HP 971A.

Go ahead, toss the HP 971A in your tool box. Rubber seals protect it from the spills and thrills you face on the job.



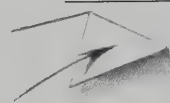
HP's innovative safety shutter prevents inadvertent connection with current terminals.

HP E2373A, HP 971A, HP 972A, HP 973A and HP 974A Handheld Multimeters

Model	HP E2373A	HP 971A	HP 972A	HP 973A	HP 974A
Display count	3,200	4,000	4,000	4,000	49,999
Basic accuracy					
dc voltage	0.7%	0.3%	0.2%	0.1%	0.05%
ac voltage	1.2%	1%	0.5%	0.7%	0.5%
Ohms	0.7%	0.5%	0.2%	0.2%	0.06%
Capacitance	—	—	1.2%	1.2%	—
Frequency response (ac volts)	500 Hz	1 kHz	20 kHz	20 kHz	100 kHz
Resolution/maximum					
dc voltage	100 μ V/1000 V	100 μ V/1000 V	10 μ V/1000 V	10 μ V/1000 V	10 μ V/1000 V
ac voltage	1 mV/750 V	100 μ V/1000 V	10 μ V/1000 V	10 μ V/1000 V	10 μ V/750 V
Ohms	0.1 Ω /30 M Ω	0.1 Ω /40 M Ω	0.1 Ω /40 M Ω	0.1 Ω /40 M Ω	0.01 Ω /50 M Ω
Current	10 μ A/10 A	100 nA/10 A	100 nA/10 A	100 nA/10 A	10 nA/10 A
Elapsed time	—	1 min/1999 min	1 min/1999 min	1 min/1999 min	1 sec/9999 min
Frequency	—	1 Hz/100 kHz	0.01 Hz/200 kHz	0.01 Hz/200 kHz	0.01 Hz/200 kHz
Safety shutter		•	•	•	•
High-energy fuse, overload alert		•	•	•	•
Relative, percent		•	•	•	•
Min/max, average		•	•	•	•
Hold, autohold		•	•	•	•
Bargraph	•	•	•	•	•
Thermistor temp.		•	•	•	•
Thermocouple temp.				•	
Dual digital display			•	•	
True rms ac response				•	•
ac + dc				•	•
dBm/dB				•	•
Warranty	3 years				
Ordering information					
HP E2373A Handheld multimeter	\$99.00 ea.		HP E2304A Soft carrying case	\$19.00 ea.	
HP 971A Handheld multimeter	195.00 ea.		HP E2306A Deluxe test lead kit	35.00 ea.	
HP 972A Handheld multimeter	245.00 ea.		HP E2307A Thermocouple bead probe type-K (HP 973A only)	25.00 ea.	
HP 973A Handheld multimeter	290.00 ea.		HP E2308A Thermistor temperature probe	35.00 ea.	
HP 974A Handheld multimeter	370.00 ea.				
Opt. W50 Additional 2-year warranty	45.00 ea.				

Note: All HP 970-series multimeters have Vdc, Vac, ac/dc current, ohms, continuity, diode test, autodiode test, temperature °F and °C, frequency, auto/manual ranging, autopower off, secondary display for range and min/max, and 3-year warranty. Standard accessories include a pair of test leads, operating and calibration manual, Certificate of Calibration, spare fuse, and rubber boot. Two 1.5 V AA alkaline batteries installed.

The HP E2373A has Vdc, Vac, ac/dc current, ohms, continuity, diode test, auto/manual ranging, and a 3-year warranty. Standard accessories include a pair of test leads, manual, spare fuse, and installed batteries.



From spare leads to thermocouples — turn the page for must-have accessories.

Compare these DMMs with all the popular models on the market. And don't let a tight budget stop you; call HP DIRECT and ask about the HP E2373A — only \$99!

1-800-452-4844



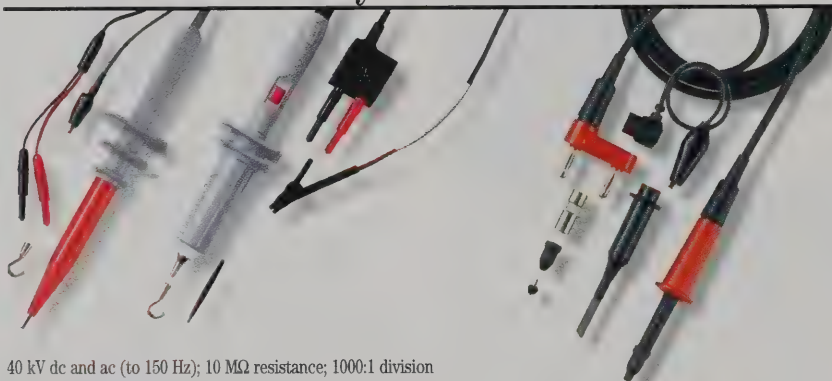
Within budget, without compromise.

Get the most from your handheld or HP 34401A multimeter with these accessories.



Test leads are 1.2 m (48 in) long with straight shrouded banana plug inputs. Kit comes in Velcro®-sealed pouch.
HP 34130A Deluxe Test Lead Set.....\$35.00 ea.

Accessories for both your HP handheld multimeter and HP 34401A.



40 kV dc and ac (to 150 Hz); 10 MΩ resistance; 1000:1 division

**HP 34300A 40 kV ac/dc
High-Voltage Probe.....\$90.00 ea.**

5 kV dc and ac (to 1 MHz); 10 MΩ resistance; 1000:1 division.

**HP 34119A 5 kV ac/dc
High-Voltage Probe.....\$130.00 ea.**

100 kHz to 700 MHz bandwidth. 0.25 Vrms to 50 Vrms range.
+1 dB accuracy to 500 MHz, +2 dB to 700 MHz.
1 Vdc output for 1 Vrms input. For use with any DMM with
10 MΩ input resistance.

HP 34301A 700 MHz RF Detector Probe...\$80.00 ea.



+10 A ac or dc; or +100 A ac or dc probe.
1 kHz bandwidth. +1.0 Vdc output at 10 A or 100 A.
+2% accuracy. 19 mm aperture.

**HP 34302A Clamp-on ac/dc
Current Probe.....\$250.00 ea.**

HP handheld multimeter accessories. *Note: Type-K thermocouple probes are for use with HP 973A multimeter only.*



Padded case with dual zipper and snap-on belt strap.

**HP E2304A Handheld Multimeter
Carrying Case.....\$19.00 ea.**



Test leads are 1.2 m (48 in) long with right-angle shrouded banana plug inputs. Kit comes in Velcro®-sealed pouch.

HP E2306A Deluxe Test Lead Kit.....\$35.00 ea.
HP E2305A Spare Test Leads (2 pairs)....\$15.00 ea.
(not shown)



Basic accuracy +2.2 °C (4 °F).
Must use with HP E2303A adapter.

**HP E2301A Surface Type-K
Thermocouple Probe.....\$120.00 ea.**

Used to connect type-K thermocouple probes to
HP 970-series handheld DMMs.

**HP E2303A SMP-to-Dual
Banana Plug Adapter.....\$12.00 ea.**

Win a FREE HP Multimeter!

Enter HP's
monthly drawing
for an HP 970-series
handheld multimeter.

Seems like a fair trade —
give us a few seconds of your
time by sending us the business
reply card on the next page, and
we'll enter you in a monthly drawing
for an HP 970-series handheld multimeter.
Plus, we'll make sure you keep receiving the
latest information on all of HP's value-priced
basic instruments.



While you're at it, feel free to do a friend a favor. For free.

Give us a name and address, and we'll make sure your friend or colleague
gets the latest issue of the HP Basic Instruments Catalog, too.

Mr. Ms. Dr. (circle one)

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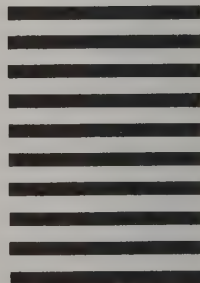
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We'll trade you this card for a chance at a FREE multimeter.

- ☐ YES! Send me the latest HP Basic Instruments Catalog. Please ADD me to your mailing list.
- ☐ UPDATE my address on your mailing list.
- ☐ Please DELETE me from your mailing list.

PLACE YOUR MAILING LABEL
FROM BACK COVER HERE

Mr. Ms. Dr. First _____ M.I. _____ Last _____
(circle one)

Company _____ Dept./Bldg. Mail Stop _____

Street Address _____

City _____ State _____ ZIP _____

Telephone: Area Code (____) _____ Extension _____

Which of these electronic test instruments do you use, specify, or buy?

- 5709 ☐ Digital Multimeters
- 5703 ☐ Oscilloscopes
- 5702 ☐ Counters
- 5301 ☐ Pulse/Function Generators
- 5711 ☐ Bench Power Supplies
- 5710 ☐ System Power Supplies
- 5706 ☐ Logic Analyzers
- 5704 ☐ Meters
- 52 ☐ Data/Telecommunications Testers
- 5107 ☐ Microwave Power Meters
- 5105 ☐ Spectrum Analyzers
- 5106 ☐ Network Analyzers
- 5501 ☐ Data Acquisition & Control
- 5502 ☐ Dynamic Signal Analyzers
- 56 ☐ Computer-Aided Test Software
- ☐ Other

Check the occupation which most closely describes your work:

- 11 ☐ Electrical Engineer
- 12 ☐ Mechanical Engineer
- 15 ☐ Industrial Engineer
- 1B ☐ Production Engineer
- 1E01 ☐ Engineering Technician
- 54 ☐ Purchasing Agent
- 51 ☐ Administrator
- 3 ☐ Information Systems
- 71 ☐ Teacher/Professor/Trainer
- 21 ☐ Scientist/Researcher
- ☐ Other

Check the department in which you work:

- 32 ☐ Research & Development
- 31 ☐ Manufacturing
- 33 ☐ Quality Assurance
- 36 ☐ Equipment Maint./Calibration
- 26 ☐ Purchasing
- 21 ☐ General Mgmt./Admin.
- 41 ☐ Sales
- 42 ☐ Marketing
- 43 ☐ Service/Support
- 53 ☐ Education/Training
- ☐ Other

Check the title which best describes your position:

- 1 ☐ Board Member/President/Owner
- 21 ☐ Vice President/Other Officer
- 22 ☐ General/Functional Manager
- 23 ☐ Middle Manager/Dept. Head
- 24 ☐ Supervisor/First-Level Manager
- 31 ☐ Project Leader
- 32 ☐ Individual Contributor/Staff
- ☐ Other

Check the industry that best describes your company at your location:

MANUFACTURING

- 32 ☐ Industrial Machinery & Equipment
- 33 ☐ Computer & Peripheral Equipment
- 35 ☐ Communications Equipment
- 36 ☐ Electronic Components
- 37 ☐ Automotive & Other Transport
- 38 ☐ Aerospace/Defense Equipment
- 39 ☐ Instrument Manufacturing
- 3A ☐ Consumer Electronics

SERVICE

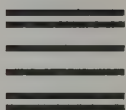
- 74 ☐ Electronic Equipment Rental
- 72 ☐ Research & Development Labs
- 82 ☐ Education

GOVERNMENT/OTHER

- ☐ Government
- ☐ Other

Number of employees at your business location:

- 1 ☐ 1-99
- 2 ☐ 100-499
- 3 ☐ 500-999
- 4 ☐ 1,000-4,999
- 5 ☐ 5,000-14,999
- 6 ☐ Over 15,000



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UNITED STATES

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HP DIRECT TMO
PO BOX 50068
PALO ALTO CA 94303-9513**





Cordura® pouch fits on top of the HP 34401A DMM, the HP 53131/32/81A counter and the HP 33120A function/arb generator.

HP 34161A Accessory Pouch\$38.00 ea.



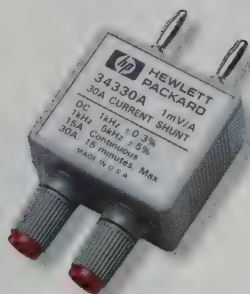
Works with any DMM with 4-wire Ω function. Gold-plated flat tweezers ensure precise contact to the components being measured. Maximum input voltage is 42 V.

HP 11059A Kelvin Probe Set\$135.00 ea.



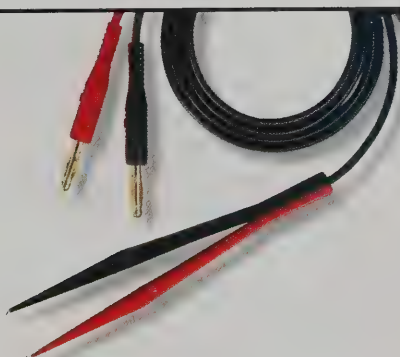
Two silver-plated flat tweezer clips to construct your own Kelvin probe set for 4-wire Ω measurements.

HP 11062A Kelvin Clip Set\$26.00 ea.



1 mV/A output; 15 A continuous; 30 A for 15 minutes maximum.

HP 34330A 30 A Current Shunt\$55.00 ea.



Tweezer designed for easy access to surface mount components. Maximum voltage: 42 Vp.

HP 11060A Surface Mount Device Probe\$24.00 ea.



Low thermal jumpers to minimize error in low-voltage measurements.

HP 11053A Lug-to-Lug Jumpers\$29.00 ea.
HP 11174A Lug-to-Banana Jumpers\$29.00 ea.
HP 11058A Banana-to-Banana Jumpers\$29.00 ea.



Basic accuracy $\pm 2.2^{\circ}\text{C}$ (4°F).

HP E2307A Type-K Thermocouple Bead Temperature Probe\$25.00 ea.



5 k Ω at 25°C . Basic accuracy $\pm 0.2^{\circ}\text{C}$ (0.4°F).

HP E2308A Thermistor Temperature Probe\$35.00 ea.*

*For use only with the HP 970-series handheld multimeters.



Hit the road and power your instruments from a cigarette lighter with the HP 34397A dc-to-ac inverter. Accepts inputs from 10.5 to 15 V and provides 100 W max power at 115 Vac. Optional 230 Vac output is available, too.

HP 34397A 12 V dc to 115 V ac inverter\$160.00 ea.
Option 0E3 230 V ac output

Call a sales engineer to talk about any meter needs you have.

1-800-452-4844

Custom waveform generation in a function generator at this price? Sure!

\$1,725

What can you expect from a function generator this affordable? Everything.

You know the feeling. You'd like to have more confidence in your test signals, but you can't afford one of those top-of-the-line function generators. Meet the HP 33120A function/arb generator, with the rock-solid stability of digital synthesis at a price even your accounting department will feel good about.

And not only do you get better performance, you get arbitrary waveforms available for the first time in this price range. Just imagine the ways you could use complex custom waveforms, from simulating heartbeats and vibrations to testing circuits in ways never before possible at this price. With 12-bit resolution, 40 MSa/s, and storage for up to four 16 k-deep waveforms, you have nearly unlimited flexibility.

Spectral purity this good means no hidden surprises.

Low cost means messy harmonics and other extra baggage, right? Well, check out the harmonic distortion specs and

clear signals you get with the HP 33120A. Then try to find the same performance anywhere else at this price.

Everybody promises functionality. But we made it effortless.

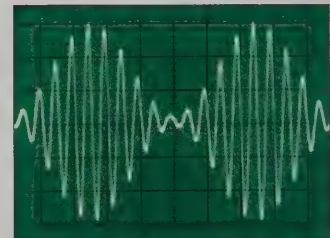
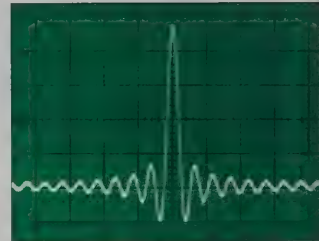
In fact, you can access any of ten major functions with a single key press. Sweep

and modulation expand your test options without expanding your equipment list. Plus you get full programmability using Standard Commands for Programmable Instruments (SCPI) with standard HP-IB and RS-232.

Create any
waveform
you need. Call
HP DIRECT.

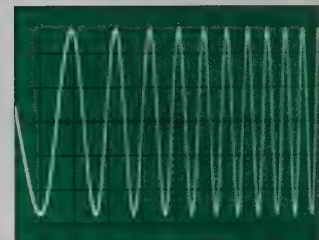
1-800-
452-4844

A built-in 16 k-deep arbitrary waveform generator handles your custom waveform needs.

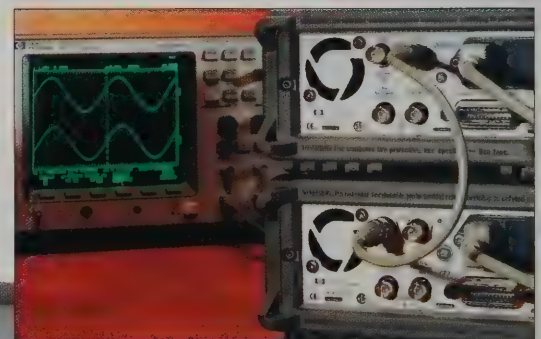


Internal AM, FM, FSK, and burst modulation eliminate the need for a second modulation source.

Both linear and log sweeps are built in, making filter and amplifier testing quick and easy.



The Option 001 phase lock/TCXO timebase increases the HP 33120A's frequency stability and opens up new system options. Generate precise phase-offset signals, phase-lock two HP 33120As or sync your generator to a 10 MHz frequency standard. You can even tie an entire ATE system to a master clock.



HP 33120A Function/Arbitrary Waveform Generator

Waveforms

Standard	Sine, square, triangle, ramp, noise, sin(x)/x exponential rise and fall, cardiac, dc volts
Arbitrary	
Waveform length	8 to 16,000 points
Nonvolatile memory	Four waveforms (each from 8 to 16,000 points)
Amplitude resolution	12 bits
Sample rate	40 MSa/s

Frequency characteristics

Sine	100 μ Hz–15 MHz	White noise	10 MHz bandwidth
Square	100 μ Hz–15 MHz	Resolution	10 μ Hz or 10 digits
Triangle	100 μ Hz–100 kHz	Accuracy	10 ppm in 90 days
Ramp	100 μ Hz–100 kHz		(18 °C–28 °C)

Sinewave

Harmonic distortion	
dc to 20 kHz	–70 dBc
20 kHz to 100 kHz	–60 dBc
100 kHz to 1 MHz	–45 dBc
1 MHz to 15 MHz	–35 dBc
THD dc to 20 kHz	<0.04%

Output characteristics

Amplitude	
(into 50 Ω)	50 mVp-p–10 Vp-p
(into open circuit)	100 mVp-p–20 Vp-p
Accuracy (at 1 kHz)	\pm 1% of specified output
Flatness (sinewave relative to 1 kHz)	
< 100 kHz	\pm 1% (0.1 dB)
100 kHz to 1 MHz	\pm 1.5% (0.15 dB)
1 MHz to 15 MHz	\pm 2% (0.2 dB)

Modulation

AM		FSK	
Carrier –3 dB Frequency	15 MHz (typical)	Internal Rate	10 mHz–50 kHz
Modulation	Any internal waveform including Arb	Deviation	10 mHz–15 MHz
Frequency	10 mHz–20 kHz	Source	Internal/external (1 MHz max.)
Depth	0%–120%	Burst	
Source	Internal/external	Carrier Frequency	5 MHz max.
FM		Count	1 to 50,000 cycles
Modulation	Any internal waveform including Arb	Start Phase	–360° to +360°
Frequency	10 mHz–10 kHz	Internal Rate	10 mHz–50 kHz \pm 1%
Deviation	10 mHz–15 MHz	Gate Source	Internal/external gate
Source	Internal only	Trigger Source	Single, external or internal rate

Option 001 Phase Lock/TCXO Timebase

Timebase accuracy	
Stability	\pm 1 ppm 0 °C–50 °C
Aging	<2 ppm in first 30 days (continuous op)
	0.1 ppm/month (after first 30 days)

External reference/Input Lock range	10 MHz \pm 50 Hz
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Internal reference/Output Frequency	10 MHz
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Power	100 V/120 V/220 V/240 V
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Net weight	4 kg (8.8 lbs)
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Size	254.4 mm W x 103.6 mm H x 374 mm D (10.0 x 4.0 x 15.1 in)
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Warranty	3 years
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Ordering information

HP 33120A Function/Arb generator	\$1,725.00 ea.	Opt. W50 Additional 2-year warranty	\$45.00 ea.
Opt. 001 Phase Lock/TCXO Timebase	395.00 ea.	Opt. 910 Extra manual set	36.00 ea.
Opt. 106 HP 34811A BenchLink Arb software	295.00 ea.	HP 34161A Accessory pouch	38.00 ea.
(can also be ordered separately as HP 34811A)		HP 34397A dc-to-ac inverter	160.00 ea.
Opt. 1CM Rack mount kit	52.00 ea.		

See page 33 for RS-232 and HP-IB cable needs.

Manufactured to reduce cost — not capability.

When our engineers design low-cost products, manufacturing time is one of their top concerns. After all, money we squeeze out of the production process is money that stays in your pocket.

For the HP 33120A, specialists from R&D, production, and quality assurance started with the goal of creating a no-compromises product that could be manufactured quickly and efficiently. They finished with a function generator that we can assemble in less than one-third the time its predecessor took. The new design cuts test time in half, too.

Bob Langenburg
AAS/BS
Southern Illinois University

Create waveforms on a PC and download them to the HP 33120A with HP 34811A BenchLink Arb software.
(See pages 30–31.)



Within budget, without compromise.

I've had a lot of experience with function generators. Give me a call.

1-800-452-4844

225 MHz counters: first you save money, then you save time.

Universal and RF counters that give a lot more than they take.

The HP 53100-series provides exceptionally fast measurements, unfaltering accuracy, and rugged, lightweight construction that fits as nicely within your budget as it does on your benchtop. Choose the model with the features you need, with frequencies up to 1.5, 3, or 5 GHz as options.

No more waiting between measurements.

The HP 53100-series uses real-time digital signal processing to analyze data while simultaneously taking new readings. So while other counters are stuck in processing "dead time," these HP counters have already moved on to the next measurement.

Not only faster, they're also easier to use.

With automated limit tests and one-button access to the features you need most, you'll get the job done in a hurry. And once you've set up for a test, a touch of the Recall button will instantly restore that setup when you need it again.

It's easy to get more from your test data, too. You can perform statistics on all measurements and simultaneously measure and track average, min/max and standard deviation.

Automation is fast and easy, too.

With the HP-IB interface, standard command language (SCPI), and

continuous data transfer rates of over 200 measurements per second, you'll get the job done in a hurry.

**Fast. Accurate.
Easy. For even
MORE on
these counters,
call HP DIRECT.**

1-800-
452-4844

Only \$1,725
HP 53131A



A quick glance at the analog mode display tells you whether a measurement is within pass/fail limits.



An advanced method for measuring frequency and time intervals gathers more data with each measurement, so you get higher-resolution answers in a fraction of the time.

Speed, function and economy: pick the model that's best for you.

The HP 53131A offers 10 digit/sec resolution at up to 225 MHz on two channels (with an optional 3 or 5 GHz third channel), with a variety of measurements — from frequency, time interval, and pulse parameters to phase angle and totalize.

Need more performance? HP 53132A offers the same measurement set as the HP 53131A, with up to 12 digit/sec resolution — the highest measurement throughput and resolution available.

Need a counter optimized for RF applications? The value-priced HP 53181A RF counter provides 10 digits/second up to 225 MHz, with the option of a 1.5, 3, or 5 GHz second channel.



HP 53132A \$2,495

- Same features and functions as the HP 53131A
- Increased resolution — up to 12 digits/sec
- Even faster measurement rates for most signals



HP 53181A \$1,500

- Same speed, accuracy and resolution as HP 53131A at a budget price
- Same statistics, math, and automated limit testing
- Frequency, period, and peak voltage measurements
- Optional second channel provides 1.5, 3, or 5 GHz measurements

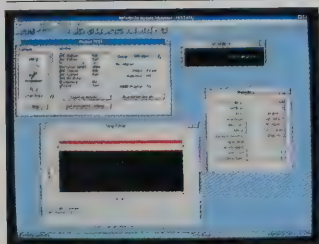


HP 53131A, HP 53132A 225 MHz Universal Counters and HP 53181A 225 MHz RF Counter

	HP 53131A	HP 53132A	HP 53181A
Measurements	Frequency, frequency ratio, time interval, period, rise/fall time, positive/negative pulse width, duty cycle, phase (CH 1 to CH 2), totalize, peak voltage, time interval average, time interval delay		Frequency, frequency ratio (with optional CH 2), period, peak voltage
Analysis	Automatic limit testing, math (scale and offset), statistics (minimum, maximum, mean, standard deviation). Statistics available on all measurements or only measurements that fall within limits.		
Measurement characteristics			
Frequency range	CH 1 & 2: dc–225 MHz	CH 1 & 2: dc–225 MHz	CH 1: dc–225 MHz
Frequency resolution	10 digits/sec	12 digits/sec	10 digits/sec
Measurement speed	Up to 200 meas/s	Up to 200 meas/s	Up to 200 meas/s
Time interval resolution (LSD)	500 ps	150 ps	NA
Input conditioning	(Independently selectable on CH 1 & 2)	(Independently selectable on CH 1 & 2)	(Selectable on CH 1)
Impedance, coupling	1 M Ω or 50 Ω , ac or dc	1 M Ω or 50 Ω , ac or dc	1 M Ω or 50 Ω , ac or dc
Low pass filter	100 kHz, switchable	100 kHz, switchable	100 kHz, switchable
Attenuation	$\times 1$ or $\times 10$	$\times 1$ or $\times 10$	$\times 1$ or $\times 10$
External timebase reference input	1, 5, 10 MHz	10 MHz	1, 5, 10 MHz
Trigger	CH 1 & 2 Trigger on rising/falling edge; set level by percent of signal level or absolute voltage; set sensitivity to LOW, MED, or HIGH	CH 1 & 2	CH 1
Gating and arming	Auto, manual (set gate time or number of digits of resolution); external; delay		
Interfaces	Standard HP-IB (IEEE 488.1 and 488.2) with SCPI-compatible language; talk only RS-232		
Power	90–132 Vac; 45–66 Hz or 360–440 Hz/198–264 Vac; 45–66 Hz		
Net weight	3 kg (6.5 lbs)		
Size	212.6 mm W x 88.5 mm H x 348.3 mm D (8.5 x 4.0 x 14.0 in)		
Warranty	3 years		
Ordering information			
HP 53131A 10 digit per second 225 MHz Universal counter	\$1,725.00 ea.	Opt. 002 External dc power	\$250.00 ea.
HP 53132A 12 digit per second 225 MHz Universal counter	2,495.00 ea.	Opt. 010 High-stability timebase	900.00 ea.
HP 53181A 10 digit per second 225 MHz RF counter	1,500.00 ea.	Opt. 012 Ultra-stability timebase	1,500.00 ea.
(counters include power cord, operating & programming manuals)		Opt. 015 1.5 GHz Channel 2 (HP 53181A only)	500.00 ea.
HP 34812A BenchLink Meter	295.00 ea.	Opt. 030 3 GHz Channel 3 (3 GHz Channel 2 on HP 53181A)	800.00 ea.
Opt. W50 Additional 2-year warranty* starts at	45.00	Opt. 050 5 GHz Channel 3 with type-N connector (CH 2 on HP 53181A)	2,350.00 ea.
Opt. 001 Medium-stability timebase	600.00 ea.	HP 34397A dc-to-ac inverter	160.00 ea.

Complete your test system with quality HP cables; see page 33.

*Call HP DIRECT for more information on Opt. W50 prices.



Add value to your counter data!
HP 34812A BenchLink Meter adds
graphics, more statistics, and
archiving. See page 31.

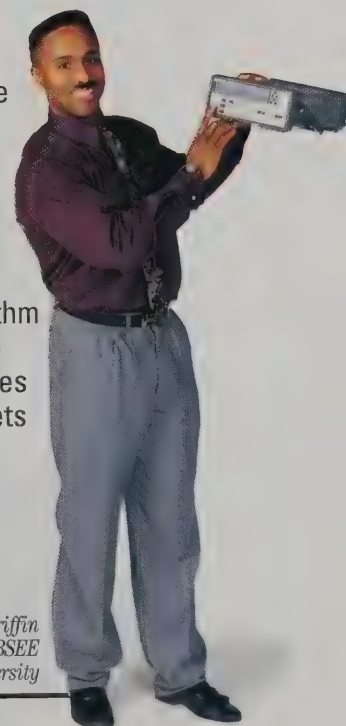
Delivering innovative technology at an everyday price.

It would be just about impossible to create counters at prices this low if you started from scratch. Fortunately, our engineers didn't have to. By leveraging innovative technology developed for HP's modulation domain analyzers

(MDAs), they gave these low-cost counters top-of-line performance.

For instance, it's the MDA's signal processing algorithm (programmed into the HP 53100-series gate array) that lets us offer up to 12 digit/second resolution in a value-priced counter.

Hardy Griffin
BSEE
Colorado State University



For the counter that best meets your measurement needs,
call HP DIRECT.

1-800-452-4844

Forget about "or." The key word here is "and."

Programmability and 80 watts of power and triple outputs and 0.01% regulation.

Tired of people asking you to choose, then charging you for the privilege? Now you can take it all with the new HP E3631A triple dc power supply — and pay a lot less than you'd pay for some of those other supplies.

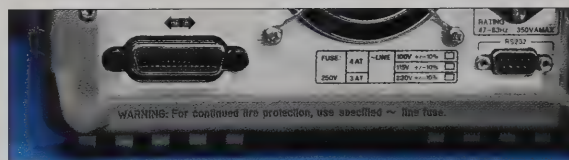
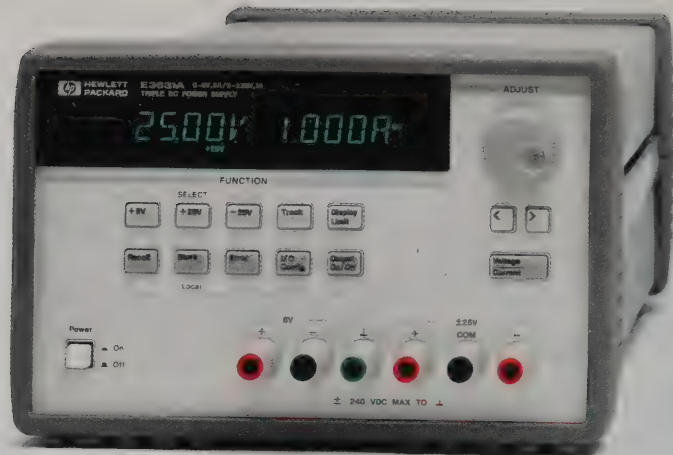
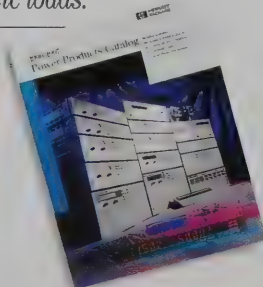
Run it any way you like.

Operate the HP E3631A as a stand-alone bench supply, setting exact output levels quickly with the dual voltage and current meters. The 6-volt supply is completely isolated from the two 25-volt supplies, which you can track together; operate independently or operate as a single 50-volt supply.

Connect the HP E3631A to a PC or other controller via the built-in HP-IB or RS-232 port, and you'll have a versatile power source for automated test.

No matter how you use it, count on the HP E3631A to power your projects for a long time to come — we back it up with an industry-leading three-year warranty.

Ask for a copy of the HP Power Products Catalog to find all of HP's ac sources, dc power supplies and electronic loads.



Programmability is standard with both HP-IB and RS-232.

Only \$995

HP E3631A Triple Output DC Power Supply					1	2	3
DC outputs							
Voltage					0 to +25 V	0 to -25 V	0 to 6 V
Current					0 to 1 A	0 to 1 A	0 to 5 A
Load and line regulation							
Voltage						<0.01% + 2 mV	
Current						<0.01% + 250 μA	
Ripple and noise							
Normal mode voltage						<350 μVrms/2 mVp-p	
Normal mode current					<500 μArms	<500 μArms	<2 mArms
Common mode current						<1.5 μArms	
Programming accuracy							
Voltage					0.05% + 20 mV		0.1% + 5 mV
Current					0.15% + 4 mA		0.2% + 10 mA
Readback/meter accuracy							
Voltage					0.05% + 10 mV		0.1% + 5 mV
Current					0.15% + 4 mA		0.2% + 10 mA
Resolution							
Program/readback					1.5 mV/0.1 mA		0.5 mV/0.5 mA
Meter					10 mV/1 mA		1 mV/1 mA
Transient response					50 μsec for output to recover to within 15 mV following a change in output current from full load to half load or vice versa		
Supplemental Characteristics							
Command processing time					<100 msec		
Voltage programming speed to within 0.1% of final value					Full load	No load	Full loadNo load
Up					50 msec	20 msec	11 msec10 msec
Down					45 msec	400 msec	13 msec200 msec
Isolation					±240 Vdc		
Size					132 mm H x 213 mm W x 360 mm D (5.2 x 8.4 x 14.2 in)		
Weight					8.2 kg (18 lbs)		
Warranty					3 years		
Price (U.S. list)					\$995		

Put it all on your bench.

1-800-452-4844

These multiple output power supplies fit your budget as well as your benchtop.

Only \$500

Built like system supplies, but priced for the bench.

The ordinary way to create a low-cost power supply is to offer fewer features and lower performance. Trouble is, you don't want an ordinary supply. Maybe it's time to put an HP on your bench. Only HP offers a supply packed with valuable features at the same high quality you expect from our system supplies.

With multiple outputs, there's no need to fill your benchtop — or empty your budget — with more than one supply. (The outputs on the HP E3620A are completely independent and isolated.)

You won't have to compensate for unwanted signals.

Find some peace and quiet. The peace of mind that comes from tight 0.01% load and line regulation. The quiet that comes from ripple and noise levels at <350 μ Vrms/1.5 mVp-p with minimal line current injection.

For clean power you've never expected from a benchtop power supply.

1-800-
452-4844

Protect your circuitry and your investment with the two-output HP E3620A and the three-output HP E3630A.

Smooth turn-on and turn-off transitions keep power spikes out of your circuits. The HP E3620A and HP E3630A give you stable performance from start to finish.

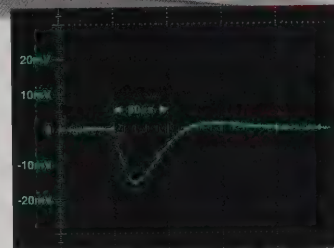
These low-cost supplies undergo the same rigorous tests as our system supplies. The result? A failure rate of less than 0.5% per year backed by a three-year warranty. Find *that* in another low-cost supply!

Make output settings quickly with an easy-to-use front panel.

Save time while you're saving money. Because separate meters display voltage and current, you can set levels precisely and monitor each output at a glance. In other words, you can focus on your circuits and test procedures instead of fiddling with your power supply.

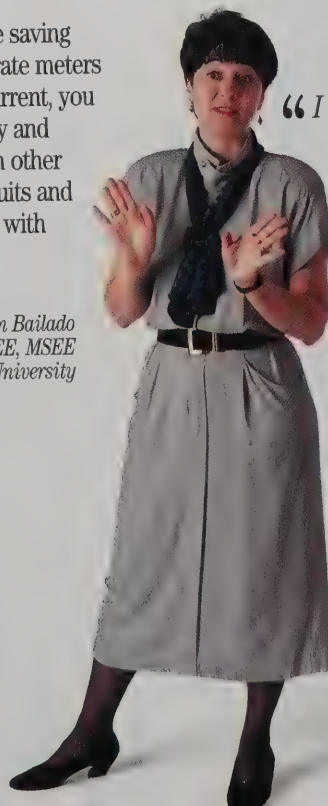
Helen Bailado
BSEE, MSEE
Santa Clara University

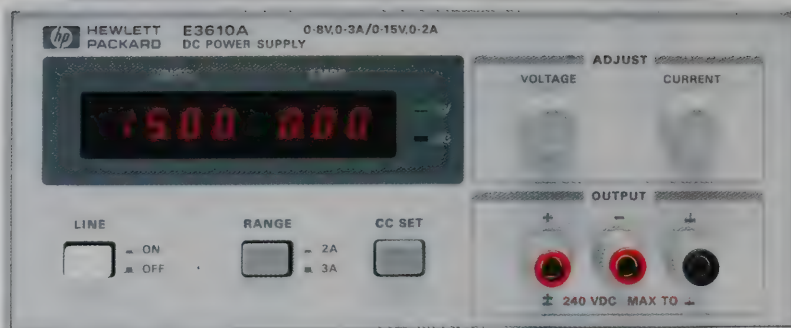
See next page for HP E3620A and HP E3630A specs and more of HP's low-cost, high-value power supplies!



Fast transient response means stable and predictable voltages for your circuitry when the load varies.

“I know you want to choose the right power supply, and you don't want to wait forever. Give me a call, and we can go over specs and features.”





Starting at
only \$300

The only thing we left out of these power supplies was the high price.

Put the performance of a system power supply on your benchtop.

Forget the usual worries about low-cost supplies. The HP E3600-series gives you clean power with dependable regulation and fast transient response. And they turn on and off without overshoot, so you get precise output from start to finish.

The pleasant surprises don't stop there. You can choose constant voltage (CV) mode or constant current (CC) mode, changing automatically based on load. In CV mode, it's easy to set safe current levels for every test.

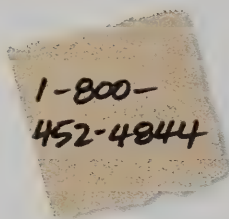
We spent a lot of time on our front panel so you won't have to.

Tired of fumbling with confusing dials and buttons? A pair of digital meters shows your output status at a glance, and the 10-turn pots are quick and accurate.

Inferior supplies cause more than employee burnout.

Whose side is your power supply on, anyway? A poorly regulated supply that puts your circuits in danger is working against you, not for you. In the

**Get clean power
with any supply
you select.**



HP E3610/11/12A, CV/CC mode lets you preset both current and voltage limits so you can be sure your circuits are getting the levels you think they are.

For even more peace of mind, check out the HP E3614/15/16/17A. Adjustable overvoltage protection — a feature you don't expect on low-cost supplies — makes it easy to keep your circuits out of

harm's way. One switch is all you need to set precise voltage and current limits.

Supplies that sense voltage levels at their outputs may not be as accurate as you need. The HP E3614/15/16/17A use remote sensing to measure voltage at the load instead. Count on unsurpassed

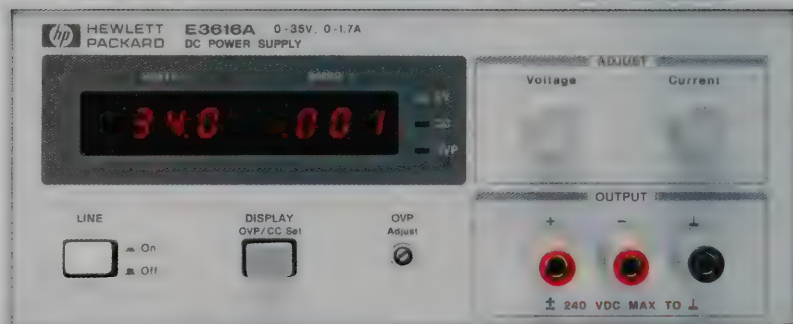
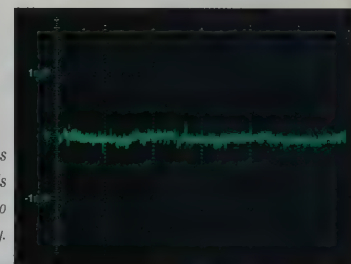
accuracy during your tests — the supply automatically compensates for voltage drops.

So stop worrying about circuit damage from poorly regulated supplies. In fact, you don't need to worry about your supply at all. With a failure rate under 0.5% per year and a three-year warranty, there's nothing left to worry about.

Control multiple supplies from one master unit.

Need more current or voltage? The HP E3614/15/16/17A let you control multiple supplies with a single unit. Autoparallel shares current equally, and autoseries shares voltage equally or proportionally. And when you're tied in series, autotracking lets you change levels simultaneously or proportionately.

*Low noise means
unwanted signals
aren't injected into
your circuitry.*



HP E3600-series dc Power Supplies

	HP E3610A	HP E3611A	HP E3612A	HP E3614A	HP E3615A	HP E3616A	HP E3617A	HP E3620A	HP E3630A
Number of outputs	1	1	1	1	1	1	1	2	3
Output (max. voltage, current)	8 V, 3 A or 15 V, 2 A	20 V, 1.5 A or 35 V, 0.85 A	60 V, 0.5 A or 120 V, 0.25 A	8 V, 6 A	20 V, 3 A	35 V, 1.7 A	60 V, 1 A	25 V, 1 A 25 V, 1 A	+6 V, 2.5 A +20 V, 0.5 A -20 V, 0.5 A
Features	Dual range, 10-turn pots, Constant Voltage (CV), Constant Current (CC) modes			Adjustable overvoltage protection, voltage programming, remote sense, rear outputs, 10-turn pots, CV, CC modes; multiple supplies can be connected for tracking or higher power				Dual outputs, 10-turn pots, CV, CL	Tracking, CV, CL
Load and line regulation	0.01% + 2 mV								
Ripple and noise voltage	<200 μ Vrms, <2 mVp-p			<200 μ Vrms, <1 mVp-p				<350 μ Vrms, <1.5 mVp-p	
Common mode current	Not specified							<1 μ Arms	
Transient response time	<50 μ sec following change in output current from full load to half load for output to recover to within: 10 mV15 mV								
Meter accuracy	$\pm 0.5\% + 2$ counts at 25 °C ± 5 °C								
Meter resolution	volts	10 mV	100 mV	10 mV	10 mV (0–20 V), 100 mV (>20 V)				10 mV
	current	10 mA	1 mA	10 mA			1 mA	10 mA	
Isolation	240 Vdc								
Size	91 mm H x 213 mm W x 319 mm D (3.6 x 8.4 x 12.6 in)			91 mm H x 213 mm W x 400 mm D (3.6 x 8.4 x 15.8 in)				Same as HP E3610A	
Warranty	3 years								
Price	\$300.00 ea.			\$500.00 ea.					
Options	Opt. 0E9 100 Vac $\pm 10\%$, Opt. 0E3 230 Vac $\pm 10\%$, Opt. W50 Additional 2-year warranty \$45.00 ea.								

How do you build more accuracy AND less cost into a power supply?

The secret is experience. Our power products engineers have years of experience designing everything from top-of-the-line system supplies to value-priced benchtop units. For the HP E3600-series, they used that experience to make sure these new supplies provide stable, dependable output signals.

Just as important, however, is our experience in manufacturing. Because our production specialists have built so many supplies over the years, they

know how to cut costs without cutting corners.

Improvements such as standardized parts for more efficient inventory management and redesigned cases with fewer screws that take less time to assemble. They seem like little things, but they add up to big savings.

So put some experience on your benchtop, with products that fit your budget without compromising performance.



Within budget,
without compromise.

Call HP DIRECT to discuss the power supply that's right for you.

1-800-452-4844

Capture it, display it, document it with HP BenchLink connectivity solutions.

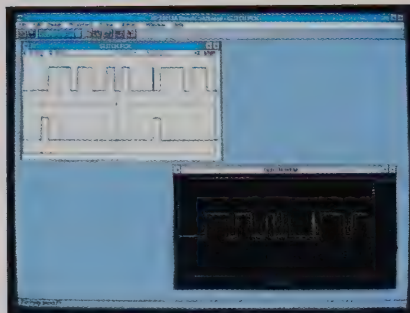
Is communicating measurement results a major part of your job? Analyzing results, documenting your work, reporting to management — the need to get more from your data never ends.

The HP BenchLink family of PC connectivity solutions makes these tasks easier. You can gather instrument data quickly and use it more effectively, and we've done all the programming for you.

HP BenchLink Scope

Time to throw out the scissors and tape.

With HP BenchLink Scope, it's easy to transfer screen images from an HP 54500- or HP 54600-series scope (or the HP 54620A logic analyzer) to your PC. From there, the Windows Clipboard makes it a snap to create polished reports or presentations by moving scope results into your Windows applications with a click of the mouse. And for archiving, just store the images



With HP BenchLink Scope, move data and screen images to your PC and use them in any Windows-based application.

on disk in either PCX or TIFF formats — with time and date stamps, too.

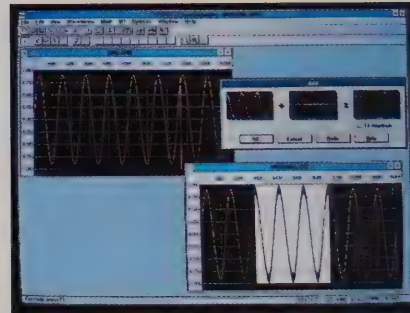
Extract more information from your data.

In addition to screen images, HP BenchLink Scope lets you transfer the actual waveform data (stored as time/voltage pairs) for analysis in spreadsheets or statistical packages. You can also use scope waveforms as input for arbitrary waveform generation by teaming up with HP BenchLink Arb.

HP BenchLink Arb

Creating waveforms is now as easy as drawing a picture.

HP BenchLink Arb turns the HP 33120A function/arbitrary waveform generator into a "design studio" for arbitrary waveforms. You can create, edit and download waveforms with the graphical ease Windows has to offer. The drawing palette lets you draw

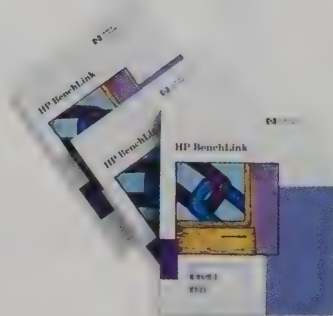


HP BenchLink Arb allows you to create your own waveforms and download them to your generator — with Windows ease.

any shape you can imagine and add noise, pulses, and sine, square, or triangle waves. (No, you don't have to be an artist!)

Creating and editing are easy; just choose the method that works best for you.

- Use the drawing tools and standard waveform library to create any waveform your application requires.
- Edit and replay waveforms captured with HP BenchLink Scope.
- Import time and voltage data in ASCII files. (Imagine this: create a waveform algorithmically in a spreadsheet or math/statistics package, then sit back and watch the HP 33120A generate it as a live signal!)

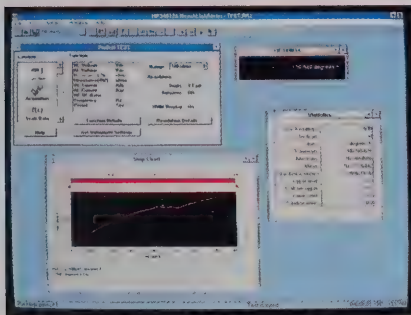


Starting at \$**295**

HP BenchLink Meter

Turn your DMM into a data collection system.

Precision and flexibility are a powerful combination. You'll get precision data from the HP 34401A digital multimeter or the HP 53100-series counters and flexibility from HP BenchLink Meter and Windows. With the instrument data on your PC, you can create graphs, move



HP BenchLink Meter adds a new visual dimension to your DMM or counter data, making it easy to graph, tabulate and store results.

test results into a variety of Windows applications, catalog test results, and perform basic statistical analysis — without writing a single line of code.

Increase the value of your DMM or counter.

When it's easy to gather test data and easy to get more information from your data, your test results become more valuable. Especially when you can use the HP multimeter or counter that you already own.

HP BenchLink Meter's ability to configure and run tests from the PC makes data gathering a breeze. It's easy to follow and evaluate incoming data with the strip chart display and limit test features. Plus, you'll discover how quick and simple trending and data comparison become with the statistics and archiving tools. All of which means you've increased the value of your instruments — and your time.

HP BenchLink Suite

If you like the idea of using HP BenchLink Scope and HP BenchLink Arb together, or if you just think you'll need more than one HP BenchLink application, we've bundled all three products in the bargain-priced HP BenchLink Suite.

HP BenchLink

Ordering information

Requirements

- 386 or 486 AT-compatible computer
- Serial port (COM 1, 2, 3, or 4), or IEEE-488 card (HP 82335A/B, HP 82340A, HP 82341A/B, or National Instruments AT-GPIB, AT/TNT, or GPIB-PC)
- 4 MB or more RAM
- MS-DOS 4.01 or later
- Windows 3.1 or later
- MS-compatible mouse
- 3.5" high-density floppy drive
- 2 MB disk space for each application

HP 34810A BenchLink Scope	\$295.00 ea.
HP 34811A BenchLink Arb	295.00 ea.
HP 34812A BenchLink Meter	295.00 ea.
HP 34820A BenchLink Suite*	395.00 ea.

Each HP BenchLink package includes a 3.5" disk and user's guide.

*This software suite includes HP BenchLink Scope, Arb and Meter.
Microsoft Windows is a U.S. trademark and MS-DOS is a registered trademark of Microsoft Corporation.

Products that fit the way you'd really like to work.

Does this sound familiar?

You need to modify a circuit, but you don't want to pull out your soldering iron before you know you have the right solution. With HP BenchLink Arb to replay waveforms captured with HP BenchLink Scope, it's easy to perform "what if" analysis without making actual circuit changes. Capture a live signal, mix in some noise, then use the HP 33120A to inject the new test signal back into your circuit. You can test the design change before you do anything drastic. This is just one of the many powerful things you can do with HP BenchLink.

To make things as easy as possible, the HP BenchLink series runs on any 386 or better PC with Microsoft Windows 3.1 or later, with either the RS-232 or HP-IB interfaces (both HP and National Instruments IEEE-488 cards are supported).

Within budget,
without compromise.

We can answer any questions about computer requirements, data compatibility, or HP-IB interface cards.

1-800-452-4844

Automation as fast as it is affordable.

Add world-class test automation for as little as **\$395** — including Windows software!

Put big-league automation on your benchtop.

Test engineers have been relying on HP-IB (IEEE-488) for years, and now you can have it with the ease and simplicity of Windows. Control instruments, transfer results, and use PC software to analyze your data — at a price you probably didn't think was possible.

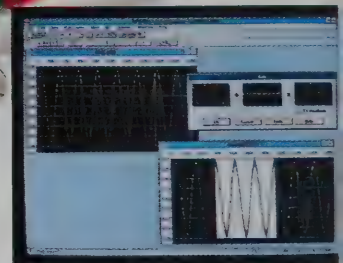
Pick the optimum level of performance.

The high-speed HP 82341C provides built-in buffering for fast I/O, making it perfect for demanding applications and multi-instrument systems. The mid-range HP 82340B is ideal for single-task applications with a dedicated PC. And

the versatile HP 82335B is the right answer for DOS setups, particularly where you want compatibility with existing programs.

Pull it together with test automation software.

The I/O libraries included with the HP 82340B and the HP 82341C contain HP's Standard Instrument Control Library (SICL) and HP's VTL 3.0. VTL 3.0 is the I/O library specified by the VXIplug&play Alliance, of which HP is a leading member. The HP Command Library, included with the HP 82335B, supports both DOS and Windows operation.



You can control any HP-IB instrument from your Windows application.



Efficiently develop test programs for most programming languages right from your PC.

HP 82335B HP-IB Card, HP 82340A HP-IB Card, and HP 82341A High-performance HP-IB Card

	HP 82335B	HP 82340B	HP 82341C
Operating system	DOS, Windows 3.1	Windows 3.1, Windows NT, Windows 95	Windows 3.1, Windows NT, Windows 95
I/O Library*	Command Library	Standard Instrument Control Library and VTL 3.0	Standard Instrument Control Library and VTL 3.0
Languages	C, Pascal, BASIC incl. Visual Basic	C/C++, Visual Basic, HP VEE	C/C++, Visual Basic, HP VEE
Backplane**	ISA/EISA (8 bit)	ISA/EISA (8 bit)	ISA/EISA (16 bit)
Max. I/O speed	355 KB/sec	520 KB/sec	750 KB/sec
Optional buffering	No	No	Yes
Warranty	1 year	1 year	1 year
Ordering information			
HP 82335B HP-IB card for Windows and DOS	\$445.00 ea.	HP 82341C High-performance HP-IB card for Windows	\$495.00 ea.
HP 82340B HP-IB card and SICL for Windows 3.1, Windows NT, and Windows 95	395.00 ea.		

*Applications written using the HP 82335B Command Library software will not run on the HP 82340B or HP 82341C.

**One ISA/EISA slot required.

Microsoft Windows is a U.S. trademark and MS-DOS is a registered trademark of Microsoft Corporation.

We're here to help you succeed with HP-IB.

Nobody's been doing HP-IB longer than the people who invented it, so you can count on HP for practical, productive solutions.

Start with the hardware. You won't find any other standard interfaces for test automation that are this affordable or this easy to install.

Next, the software libraries bundled with these cards give you a head start on instrument control, I/O, controller communications, and the other program functions you'll need.

And if you need help, the HP PC T&M Helpline has experts standing by the phone.

HP-IB from the experts at HP: it's the difference between selling you a collection of parts and making sure you have a complete solution.

Lady Oak Arnold
BSEE
Seattle University

High-quality HP cables with just one phone call.

HP-IB Cables

Product No.	Description	Length	Price
HP 10833A	HP-IB cable	1 m (3.3 ft)	\$90.00 ea.
HP 10833B	HP-IB cable	2 m (6.6 ft)	100.00 ea.
HP 10833C	HP-IB cable	4 m (13.2 ft)	110.00 ea.
HP 10833D	HP-IB cable	0.5 m (1.6 ft)	90.00 ea.
HP 10834A	HP-IB to HP-IB adapter	*	35.00 ea.

*Provides additional clearance between HP-IB cable and rear panel of instrument.

HP 50 Ω Coaxial Cables

Part No.	Description	Length	Price
8120-1838	2 BNC (m) connectors	30 cm	\$19.50 ea.
8120-1839	2 BNC (m) connectors	61 cm	20.00 ea.
8120-1840	2 BNC (m) connectors	122 cm	23.50 ea.
11000-60001	Dual banana plugs	112 cm	30.00 ea.
11001-60001	One UG-88 C/U BNC (m) conn. and one dual banana plug	112 cm	30.00 ea.

HP RS-232 Cables

Product No.	Description	Length	Price
HP 34398A	9 pin (f) to 9 pin (f) plus 9 pin (m) to 25 pin (f) adapter	2.5 m (8.2 ft)	\$20.00 ea.
HP 24542G	25 pin (m) to 9 pin (f)	3 m (9.8 ft)	45.00 ea.
HP C2913A	25 pin (m) to 25 pin (f)	1.2 m (3.9 ft)	18.00 ea.
HP C2914A	25 pin (m) to 25 pin (m)	1.2 m (3.9 ft)	18.00 ea.
HP 34399A	Adapter kit (contains 4 adapters): 9 pin (m) to 25 pin (m) for use with PC or printer 9 pin (m) to 25 pin (f) for use with PC or printer 9 pin (m) to 25 pin (m) for use with modem 9 pin (m) to 9 pin (m) for use with modem		26.00 ea.

HP RS-232 Selection Guide for Basic Instruments*

Instrument	PC or Printer Connector		
	25 pin male	25 pin female	9 pin male
HP 54600-series with HP 54652B/598 ¹ , HP 34401A ¹ , HP 33120A ¹	HP 34398A	HP 34398A + HP 34399A	HP 34398A
HP 53131/32/81A ²	HP 34398A	HP 34398A + HP 34399A	HP 34398A
HP 54600-series with HP 54651A/58A ³ , HP 54656A ⁴	HP C2913A	HP C2914A	HP 24542G

¹Instrument connector is 9 pin (m).

²Instrument connector is 9 pin (m) and is a talk port only.

³Instrument connector on module is 25 pin (f).

⁴Instrument connector on module is 9 pin (f). Must use included 9 pin (m) to 25 pin (f) adapter.

*This table recommends the compatible RS-232 cable to use when connecting basic instruments in this catalog to a PC or printer.

HP-IB and all the cables you need. Call now.

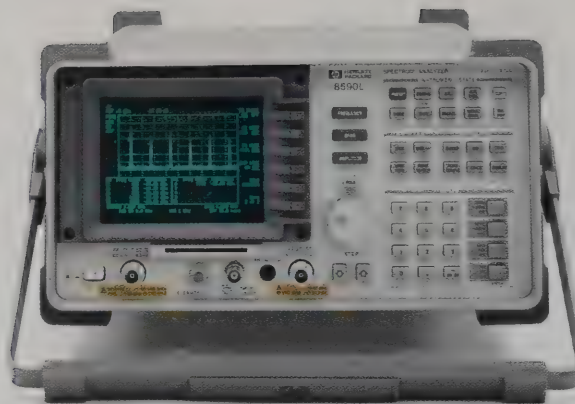
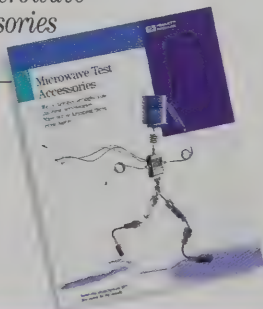
1-800-452-4844

RF Products

If your test needs extend into the RF range, you can keep looking to HP for instruments that get the job done right. And just like the Basic Instruments line, these RF products deliver the capabilities you need without capsizing your budget.

Here's a quick look at three of our most popular RF tools. The engineers at HP DIRECT can provide all the details on these products and help you select other tools to round out your RF bench — including power meters, LCR meters, and counters, too.

To complete your RF and microwave test bench, ask for a copy of HP's Microwave Test Accessories Catalog.



\$8,900

HP 8590L Portable Spectrum Analyzer

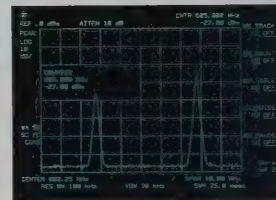
Do you appreciate quality but don't think you can afford it? Want a rugged, light-weight spectrum analyzer *and* lab-quality measurements? Frequency accuracy *and* low cost? Ease of use *and* dozens of measurement functions?

Well, you're in luck. The HP 8590L portable spectrum analyzer delivers all that capability at a price that fits just about every budget.

The HP 8590L starts with solid measurement capability, including a frequency counter with accuracy of ± 7.6 kHz at 1 GHz. Then it adds numerous functions that deliver the answers you need day after day, including third-order intercept, adjacent channel power, limit lines, and 10 peak marker tables.

Plus, the HP 8590L works hard to boost your personal productivity, from the logical front panel to the optional application personalities that give you quick access to specific test setups.

With frequency accuracy of ± 7.6 kHz at 1 GHz, you can pinpoint RF signals with confidence.



HP 8590L

- Frequency accuracy in a low-cost analyzer
- Rugged and portable
- Easy to use in the lab or in the field
- Numerous built-in measurements, including adjacent channel power
- Optional internal tracking generator to test components

HP 8590L Performance Highlights (see data sheet for details)

Frequency

Range	9 kHz to 1.8 GHz
Accuracy	± 7.6 kHz at 1 GHz (± 2.1 kHz excluding temperature drift)
Resolution bandwidths	1 kHz to 3 MHz (10 total)
Noise sidebands	≤ 105 dBc/Hz at 30 kHz offset

Amplitude

Range	-115 dBm to +30 dBm
Accuracy	± 1.7 dB (relative frequency response + IF gain accuracy)
Dynamic range (2nd/3rd order)	70 dB/80 dB
Gain compression	-10 dBm (>10 MHz)

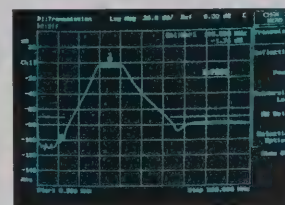
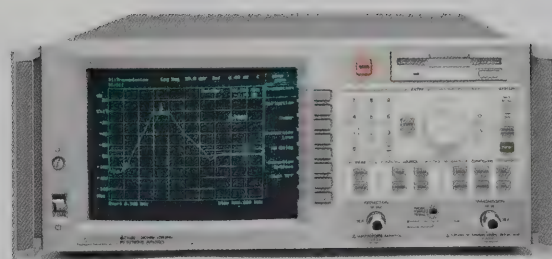
Starting at \$9,500

HP 8711B Economy Network Analyzers

The HP 8711B network analyzers provide a complete device test solution from cable TV bench test to cellular radio. They deliver production-line test speeds without sacrificing accuracy. Repetitive testing is fast and easy with the integrated

transmission/reflection test set, display markers, limit lines and optional multi-port test sets and Instrument BASIC. With 100 dB dynamic range, broadband detection, 1 Hz resolution and 40 dB corrected directivity, you'll get results you can count on, too.

Built-in limit testing is just one of the ways the HP 8711B boosts production throughput.



HP 8711B

- Choose magnitude or magnitude and phase measurements from 300 kHz to 3.0 GHz
- Ideal for testing RF components in cable, broadcast or cellular radio systems
- Rugged design and one-button automation ideal for field service, too

HP 8711B Performance Highlights (see data sheet for details)

Frequency range	300 kHz to 1.3 GHz (HP 8711B/12B) 300 kHz to 3.0 GHz (HP 8713B/14B)
Measurement type	Magnitude (HP 8711B/13B) Magnitude and phase (HP 8712B/14B)
Frequency resolution	1 Hz
Dynamic range	>100 dB (narrowband) >60 dB (broadband)
Directivity	40 dB

Starting at \$5,865

HP 8648A/B/C/D Economy RF Signal Generators

Count on the HP 8648 family of RF signal generators to provide clean, dependable signals up to 3.2 GHz. With the addition of a one-hand remote controller, the simple-to-use semi-automated interface will reduce test times, too.

HP 8648A/B/C/D

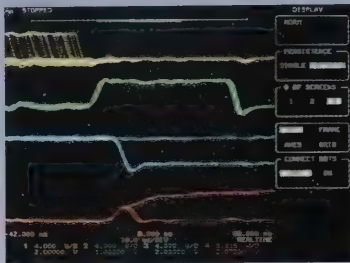
- Ideal for in-channel receiver tests
- FM, AM and PM
- Optional pulse and high power (HP 8648B/C)
- Superior output-level accuracy

HP 8648A/B/C/D Performance Highlights (see data sheet for details)

Frequency range	9 kHz (typical) to 4 GHz (HP 8648D) 100 kHz to 3.2 GHz (HP 8648C) 100 kHz to 2.0 GHz (HP 8648B) 100 kHz to 1.0 GHz (HP 8648A) 250 kHz to 1.0 GHz (HP 8647A)
Output level	-136 dBm to +10 dBm (up to +20 dBm <2.5 GHz)
Level accuracy	±1 dB down to -127 dBm (<2.5 GHz)
Spectral purity at 500 MHz SSB phase noise	-120 dBc/Hz (at 20 kHz offset typical)
Residual FM	<4 Hz (249 to 501 MHz) <7 Hz (<249 MHz, ≥501 MHz)

Call HP DIRECT today. **1-800-452-4844**

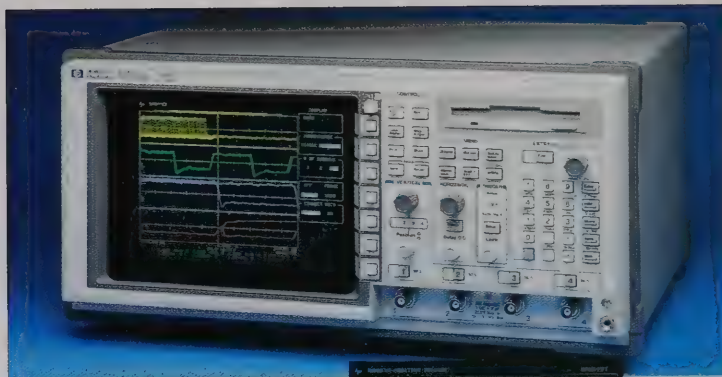
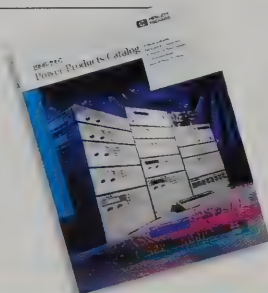
Extra Performance



Chances are the Basic Instruments line covers most of your test and measurement demands. When you need an extra level of performance, however, check out this line. These instruments deliver the quality and capability that made HP's reputation in the industry — and they're now designed with the same emphasis on customer value you see in our Basic Instruments.

The HP 54520/40-series scopes, the HP 3458A multimeter, and the HP 8110A pulse generator are just three examples of the products we offer.

Ask for a copy of the HP Power Products Catalog to find all of HP's ac sources, dc power supplies and electronic loads.

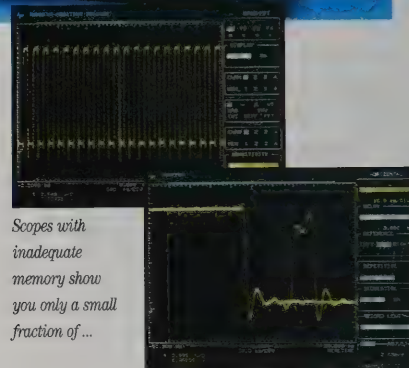


HP 54520/40-series scopes

Is your scope telling you the whole story? If it's short on speed or memory, you're not going to get a complete and accurate view of the signals in your high-speed designs.

With 32 K memory per channel, the HP 54520/40-series scopes let you maintain higher resolution over longer periods of time. And when you're armed with two or four channels running at up to 2 GSa/s (and 1 ns peak detect), you can catch hard-to-find problems before they catch you.

Starting at
\$9,500



Scopes with inadequate memory show you only a small fraction of ...

...what you'll see with the HP 54520/40-series.

HP 54520/40-series scopes

- Wide array of measurement and testing functions, from FFT to templates for pass/fail testing
- Choose two or four channels
- 500 MHz repetitive bandwidth on all models
- Single-shot bandwidths from 125 MHz to 500 MHz
- Sequential single-shot mode captures and time-tags successive pulses separated by long dead times

HP 54520/40-series Performance Highlights (see data sheet for details)

Maximum sample rate	from 500 MSa/s to 2 GSa/s
Repetitive bandwidth	500 MHz
Single-shot bandwidth	from 125 MHz to 500 MHz
Peak detect	≥1 ns
Vertical sensitivity	1 mV/div to 5 V/div
Timebase range	500 ps/div to 5 s/div
Horizontal resolution	10 ps
Memory depth	32 K per channel

Problem?

**Need to measure multiple
analog and digital signals at
the same time — and see them
on the same screen?**

No Problem!

**The HP 54645D mixed signal
oscilloscope combines a two-
channel scope with 16 channels
of logic analysis in one easy
instrument. See the special
brochure tucked in between
pages 4 and 5.**



HP DIRECT
1-800-452-4844

HP 3458A multimeter

\$6,730

When you can't compromise on either resolution or throughput, the HP 3458A multimeter delivers 8½ digits of resolution and rates of up to 100,000 readings per second. And if you need to measure low-level signals with confidence, ask about the new HP 34420A nanovolt/micro-ohm meter and its 100 pV/100 $\mu\Omega$ sensitivity.



HP 3458A

- dc volts from 10 nV to 1000 V
- Choice of analog or sampling true-rms ac volt techniques
- Resistance from 10 $\mu\Omega$ to 1 G Ω , two- and four-wire ohms, with OCOMP
- Math and statistical functions
- 20 KB of reading memory (148 KB optional)
- Self-adjusting autocalibration for all functions
- Two-source (10 V, 100 k Ω) calibration

HP 3458A Performance Highlights

(see data sheet for details)

Calibration	8½ digits resolution
Lab precision	0.1 ppm Vdc linearity 0.1 ppm Vdc transfer accuracy 8 ppm basic 1-year Vdc accuracy (4 ppm opt.) 100 ppm mid-band Vac
Test system	Up to 100,000 rdgs/sec
Throughput	340 function/range changes/sec
High-resolution digitizing	16 to 24 bits resolution Timing resolution to 10 ns



The ability to simulate real-world digital signals with precise edge positioning make the HP 8110A the ideal companion for your scope or logic analyzer. Signal-creation tools let you set up such key test signals as irregular pulse widths, pulse droop, groundbounce and multi-level waveforms.

HP 8110A

- Ideal for digital design
- Master/slave capabilities for multi-channel tests
- Variety of signal modes, including bursts and patterns
- Modular design lets you add the functions you need

HP 8110A 150 MHz pulse generator

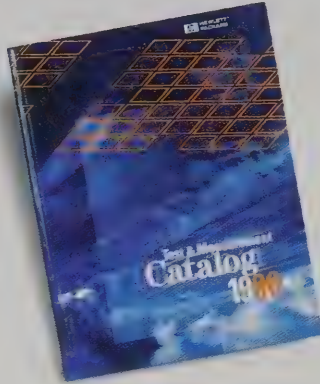
Starting at
\$10,200

HP 8110A Performance Highlights

(see data sheet for details)

Frequency	1.00 Hz to 150 MHz
Resolution	3 digits (10 ps best case)
Output level	up to 20 V
Transition time	2.5 ns, typical
Burst length	2 to 65,536 pulses or double pulses
Patterns	2 to 4,096 bits

Free catalogs for HP test and measurement products.



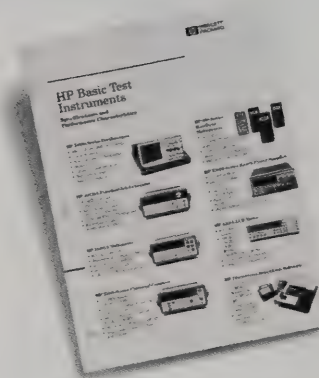
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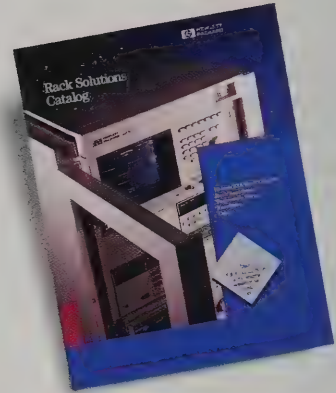
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- 54600-series 5964-9339EUS
- 33120A 5964-0146EUS
- 34401A 5964-0145EUS
- 53100-series 5964-0385EUS
- 970-series 5964-0384EUS
- E3600-series 5964-0383EUS
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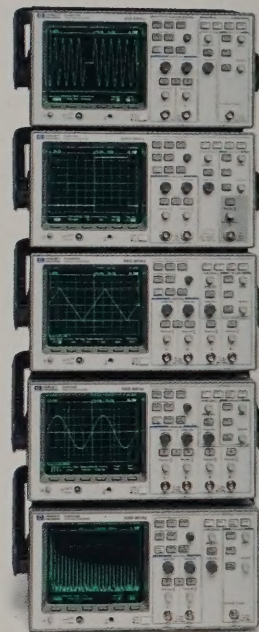
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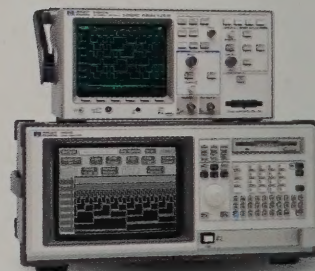
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